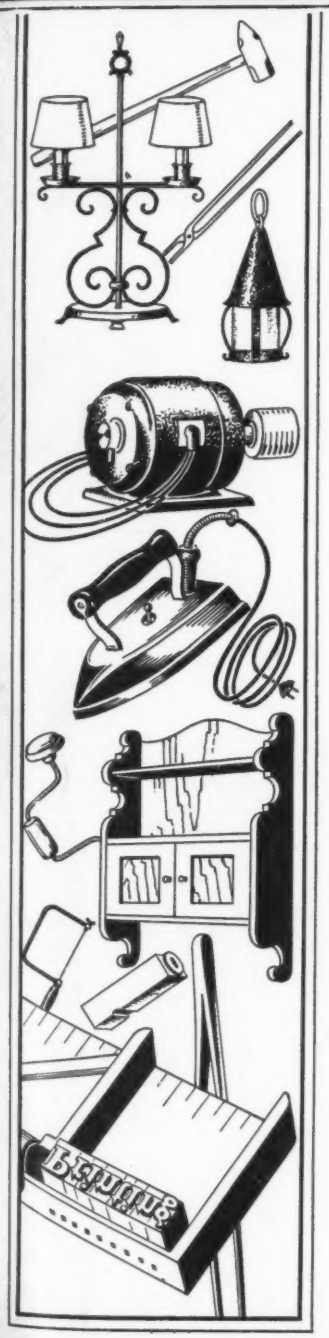
DECEMBER 1934

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION



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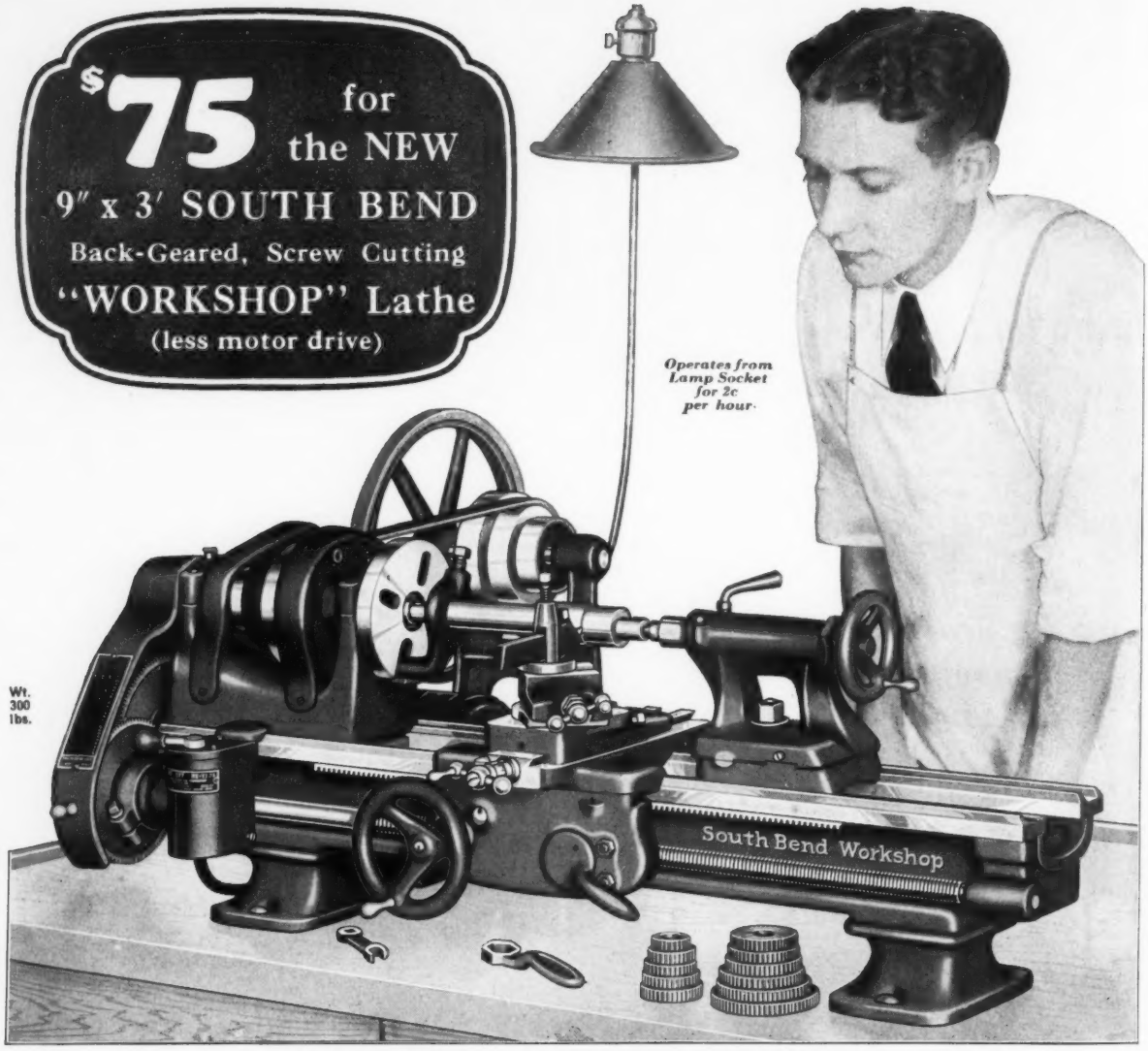

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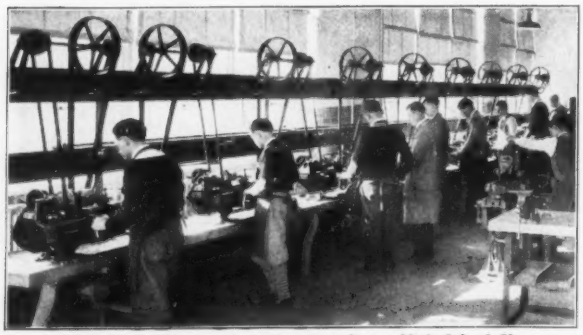

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INDUSTRIAL ARTS and VOCATIONAL EDUCATION
December, 1934
Vol. 23, No. 12

Pittsburgh—The Convention City

Theodore A. Siedle

University of Pittsburgh,
Pittsburgh, Pennsylvania

This description of Pittsburgh's schools gives a foretaste of what the visitor at the American Vocational Association Convention, December 5 to 8, can view and study.

THE Convention City's 160 public schools, including six trade schools, offer much of interest to persons attending the ninth annual American Vocational Association meeting in Pittsburgh, December 5 to 8. These schools, as well as the board of education building, will be open for visitation and inspection during the entire convention.

Of the six trade schools in Pittsburgh, four are for boys and two for girls. Those for boys are the Allegheny Vocational School, the Clifford B. Connelley Trade School, the Somers Trade School, and the Washington Trade School. The trade schools for girls are the Bellefield Girls Trade School and the Irwin Avenue Girls Trade School. The largest unit for boys is the Clifford B. Connelley School with an enrollment of 1,525 students. The Bellefield school is the larger of the two for girls. It has an enrollment of 478.

Airplane view of Pittsburgh

This year 3,085 boys, under the direction of 112 teachers, are enrolled in the various trade-training activities. The 853 girls who are taking advantage of the trade training offered in Pittsburgh schools, obtain their instruction from 32 teachers. Of the 112 teachers in the boys trade schools, 61 are listed as industrial teachers, 16 as related-subjects teachers, and 35 as academic teachers. The 32 teachers in the girls trade schools include 14 industrial, 5 related-subject, and 13 academic teachers.

Eighteen different courses are open to boys, and nine to girls. The courses offered in the boys trade schools include acetylene and electric welding, automobile mechanics, bricklaying, cabinetwork, carpentry, commercial art, electric power and equipment, electrical appliances, electric wiring, foundry, machine shop, patternmaking, plumbing, printing, radio, sheet metal, telephony, and trade drafting. The courses offered for girls are cafeteria, cooking, dressmaking, millinery, junior nursing, personal service, power-machine sewing, and tearoom.

The Pittsburgh vocational schools follow the general program prescribed under the Smith-Hughes Law which recommends that half of the time be devoted to shopwork, and that the rest be divided between related and academic training. The related and academic work includes mathematics, science, drawing, trade theory, English, social studies, library work, and physical education. Opportunities are also provided for the avocational interests of the pupils through various extracurricular activities.

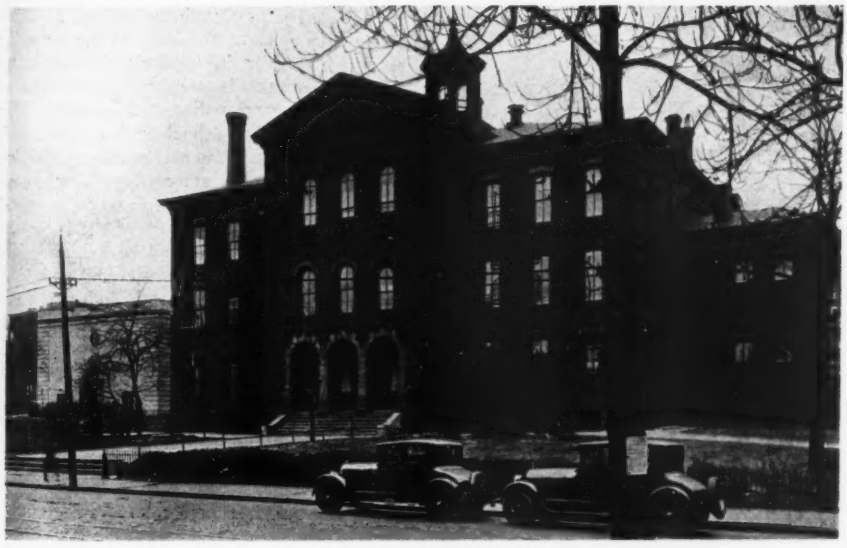
The Clifford B. Connelley Trade School

Acetylene welding class in Connelley Trade School

The monotype division of the printing department at the Connelley Trade School

Food preparation at the Bellefield Girls Trade School

Auto ignition class in Connelley Trade School

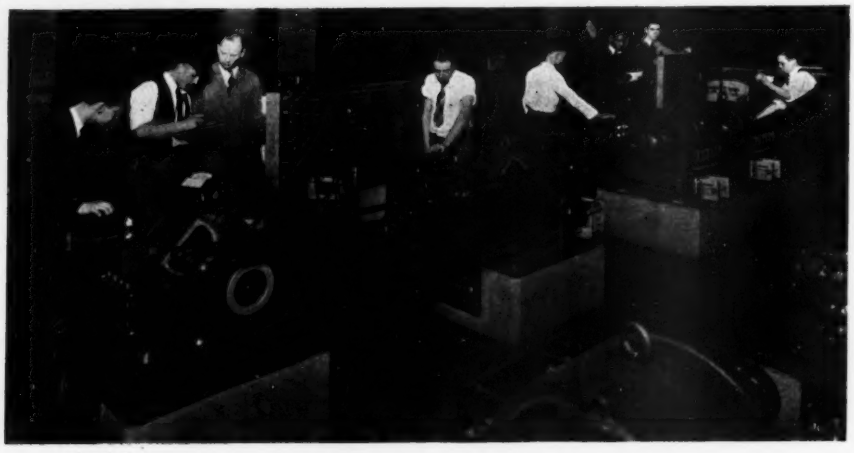


The Bellefield Girls Trade School

A class in garment making, Bellefield Girls Trade School

The courses range from two to four years in length in the different trades. The work is organized on a unit plan. Promotion is on the basis of accomplishment rather than on the length of time devoted to the work. It is the policy of the several schools to place boys and girls in jobs just as soon as they are qualified for the positions available, regardless of the number of years the pupils have attended the school. Assistance in obtaining desirable jobs for trade-school students is rendered through the services of instructors, public-school placement officers, counselors, and co-ordinator of part-time co-operative apprentice training.

Not all the trades offered are given in any one school. However, seventeen of the eighteen activities are available to boys attending the Connelley school. Seven trades are offered at the Allegheny building, six at the Washington, and five at the Somers. Eight of the nine trade courses offered for girls are given at the Bellefield school, while seven are offered at the Irwin Avenue building.



The electric laboratory in Connelley Trade School

While all schools are easily accessible by trolley or automobile, those most conveniently situated to A.V.A. Convention headquarters in Hotel William Penn are the Clifford B. Connelley school at Bedford Avenue and Fullerton Street, and the Irwin Avenue school at Irwin Avenue on the north side. The Bellefield Girls Trade School is located only a short distance from the board of education building in the Oakland district, about a twenty-minute street-car ride from Convention headquarters. All schools will be operating on regular schedules during the Convention. Visitors are invited to inspect the buildings, and those who wish may take lunch in the tearoom at the Bellefield Girls Trade School. This service is open to the public. The dining room there accommodates conveniently about fifty persons at one time.

While trade training for boys has been firmly fixed in the Pittsburgh school system for some years, the development of trade schools for girls is a comparatively new venture. The first unit for girls was opened in Pittsburgh in February, 1926, when 150 pupils were enrolled at the Irwin Avenue building. The first courses offered were in cooking, sewing, millinery, and personal service. In February, 1928, a second unit, the Bellefield Girls Trade School, was opened at Fifth Avenue and Boquet Street. The initial enrollment there was 300 girls. From these quite recent beginnings, trade-school activities for girls have been rapidly developed in Pittsburgh, until at the present time the courses offered are among the most popular of public-school offerings.

In addition to the splendid opportunities for vocational training, the Pittsburgh public schools offer a well-rounded program of industrial-arts education. The industrial-arts division includes 24 centers in elementary schools equipped for woodworking and drawing, 7 prevocational centers for over-aged or retarded pupils, 9 junior-high-school centers, 8 junior-senior high-school centers, and 4 senior-high-school centers. There are 21 industrial-arts teachers in the elementary schools, 52 teachers of shopwork and drawing in the junior high schools, and 49 teachers of shopwork and drawing in the senior high schools.

Boys in grades 7 and 8, whether in an elementary or a junior high school, take woodworking and drawing one-half day each week. The industrial-arts program in the junior high schools differs somewhat from the organization found in the regular elementary buildings. There is no particular uniformity in the equipment in these schools. However, to meet the exploratory purposes of the junior high school, definite plans are followed. Courses of study in industrial arts in the junior high schools include woodworking, drawing, general metal work, and printing. Sufficient flexibility is permitted in the programs of the various schools. This gives teachers an opportunity for initiative, and allows the pupils to express their different personalities. All the senior high schools, where the work is more nearly on an elective basis, are equipped for woodwork, patternmaking, metal work, and drawing, while the largest school has, in addition, electrical work and printing. Pupils who spend the same amount of time in industrial-arts activities as they do in other subjects earn the same number of credits given for the other subjects.

Guests during the convention who desire to see typically equipped industrial-arts departments will be interested in visiting Taylor-Allderdice Junior-Senior High School and Arsenal Junior High School. In these buildings they will see boys and girls actually at work; at the exhibits of vocational, industrial-arts, and household-economics materials which have been prepared especially for the A.V.A. meetings in Exhibit Hall of Convention headquarters, they will have an opportunity to see many finished products.

"The work offered in the Pittsburgh schools is second to none in the country," said Dr. Ben G. Graham, superintendent of Pittsburgh public schools and honorary chairman of the ninth annual American Vocational Association Convention. "We put forth every effort to give our boys and girls the latest in trade training and industrial arts, with a view to making them better citizens who will be, through the school activities, better oriented for their future work.

"The Pittsburgh vocational program," Dr. Graham further points out, "is capably administered by Frank M. Leavitt, associate superintendent, and Frederick W. Boland, director of the department of trade training. These men are fortunate in having competent and experienced building principals and counselors who are constantly on the alert for new ideas and new developments.

"The effectiveness of the Pittsburgh program," concluded the Convention City superintendent, "is shown in the work of Wesley M. Rossier, co-ordinator for all trade schools. Mr. Rossier has charge of the co-operative, part-time apprentice training. He correlates the work of the schools with industry. Because of his efforts, and those of the other persons concerned with vocational and industrial-arts education, Pittsburgh has a program of which it may well be proud."

Current Comment No. 9

Four Distinct Duties

Homer J. Smith

Professor of Industrial Education,
University of Minnesota, Minneapolis

This able discussion of the duties of the industrial-arts teacher is taken from Dr. Homer J. Smith's article "The Industrial-Arts Teacher's Responsibility," in the June, 1932, issue of Education.

FIRST, *industrial teachers must develop some skills; they must train their boys to do some things.* By the use of tools, machines, materials, and processes, they supervise construction and repair. Whatever the philosophy or the method of their endeavors — and these are reflections of their professional preparation — there is always the physical product. The tangible outcomes of the exercise, the project, and the job, are thought of as ends by the unknowing, but industrial teachers view them rather as means to ends. They are merely the by-products or the vehicles of a scheme whereby doing and planning abilities are developed. They furnish opportunity for attainment of physical and mental growths or expansions not susceptible of quickening through other types of study. That similar activities may later be engaged in for pay by some boys does not make this work vocational nor subtract in any way from its necessity for all.

Industrial teachers, in analyzing their subjects, make long lists of things that may be done. From these lists of manipulative elements they select a few to match group needs and the time at their disposal. Courses are organized in different ways but some of the skillful things are usually given more attention than others, being brought more often into the assignments or isolated for purposive drill. It may be said that every industrial teacher develops skills of two kinds; some which are simple and merely watched in the coming, others which require much repetition under control until a predetermined standard has been reached.

Second, industrial teachers must impart some informations; they must aid their boys to know some things. As a matter of fact, many industrial teachers place greater emphasis upon the knowledge aspects of their subjects than upon the skills. More teachers would do so, to the great improvement of their work, if superiors, patrons, and students were not so grounded in expectancy of product. Many teachers dare not reduce the shop output, even though they know that shading this in deference to more learning would be a wiser course. By the use of lectures, textbooks, assigned readings, homework, excursions, and the like, they could make more rapid and more certain linking with the objectives of their work.

Informational content may be roughly classified into three types, one of which is commonly overlooked or slighted. (1) There is a certain kind of information that must be supplied in order that an acceptable product may result and that injury to persons and property may be avoided. (Example: the grinding of tools, the handling of machines, the kinds of joints, the reading of drawings, and the application of finishes.) All industrial teachers impart this type of related material, although they differ greatly in the value which they assign to it and in the plans which they develop for its convenient and attractive presentation. (2) A second brand of information may be characterized as not absolutely necessary to the work in hand but broadening and cultural in effect. (Example: the identification of woods, the steel-making process, properties of materials, and principles of design.) Here, again, teachers vary in their interest and in the time devoted, but it is doubtful if one tenth of them give the deserved emphasis to this type of information. (3) Each instructor has the responsibility of imparting guidance information regarding the working fields represented by his subject. There is no necessity for extended and detailed description of the occupation being sampled, but, inasmuch as "exploration" is one of our avowed aims, it should be realized that direct instruction is required and that boys may get impressions from the school shop that need systematic correction. From the analyses mentioned earlier and from their margins of experience, good teachers select information of at least three kinds and develop it by use of the most vital methods of which they are capable.

Third, industrial teachers must stimulate some appreciations; they must bring their boys to feel some things. Just as teachers of literature motivate reading of the best through tactful selection, excellent illustration, and definite discussion of standards, so should industrial teachers elicit emotional reactions to the best things in their lines. Good instructors in music display rare skills, acquaint pupils with great compositions, and build halos for certain composers. They help their students to identify fine movements, themes, and harmonies, never neglecting to interest them in the special or high techniques involved. In like manner, industrial teachers should exhibit techniques, and seek to stimulate enthusiasm about original designs, sturdy construction, excellent materials, exact and easy craftsmanship, and the beautiful finished product. Tight joints, smooth surfaces, harmonious color effects, and the like, are ends to earn and things to be felt and appreciated. Accuracy, speed, and dexterity may be made to seem high attainments. This aspect of our service needs careful building, not alone for its effect upon individual boys, but for its ultimate use in extending pride in handiwork and increasing the number of occupations which boys will think suitable as careers. We must teach respect not only for good product but for the higher types of skill.

Fourth, industrial teachers must build some attitudes; they must encourage their boys to act in manly ways. Naturally, this is the charge of teachers of all subjects, but none are more fortunate in the situation required than are the industrial teachers. The conditions and environments of their work are specially conducive to results in the realm of attitude. They improve respect for property, both personal and public; they lead to fine co-operative endeavor; they provide trials in leadership and followership alike; they interest boys in self-improvement; and they picture the most approved and gainful relationships of later employment experience. These attitudes are often too lightly regarded and too seldom a part of our conscious instruction.

Skills, informations, appreciations, and attitudes (doing, knowing, feeling, acting) — these are the wares or the duties of every teacher. They are the unavoidable responsibilities of industrial teachers. Who would be found shirking any of them? Who will affirm that one type of teacher has better claim than another to their true and fruitful attainment? Who is unable to sense the peculiar efficacy of the industrial subjects for contributing through these means? It is all a matter of viewpoint and daily application. The desire is strong and widespread that industrial teachers will accept this fourfold responsibility and that their fellow workers will acknowledge the probability of their equality in social service as they seek to perfect their plans.

Principles of Design—IV

Franklin H. Gottshall

Scotch Plains, New Jersey

The fourth in the series of articles on the subject of design discusses the sources and kinds of ornament.

SOURCES AND KINDS OF ORNAMENT

IN THE first three articles of this series, it was shown how to secure beauty in an object by carefully planning the arrangement of masses, the outlines, and the proportions. If the rules suggested in those articles are thoughtfully carried out, great improvements should be noted in the structure and form of almost any object one may wish to design. The elements of structural form are the fundamental requirements

FIG. 24

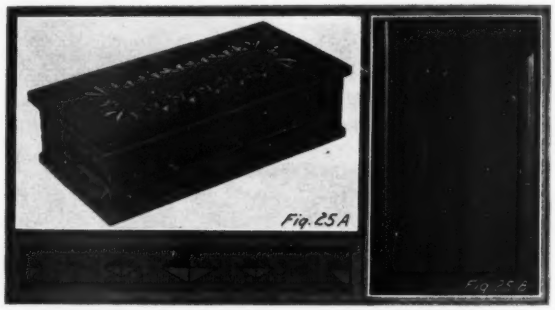
Windsor Chair

THE LACK of ORNAMENT ON THIS CHAIR IS COMPENSATED for BY SIMPLICITY of OUTLINE & BEAUTY of FORM.

of a design, and their proper planning and arrangement are of the greatest importance. These elements bear the same relation to design as meat and vegetables do to a meal. If this is true, and if the simile may be carried a little further, then ornament may be looked upon as the dressing and the dessert of design. Ornament, more especially that which is intended for surface enrichment, is a thing that we can do without, and still not impair the utility of an object. If an object has pleasing form, it does not necessarily need ornament to make it beautiful. This is well illustrated by the design of the Windsor chair shown in Figure 24.

The desire for ornament, however, is older than written history. Evidence of this is found in every archeological excavation where ornaments of excellent design are found painted upon walls, carved upon stone, molded into pottery, engraved upon metals. The desire for ornament is just as apparent today as it was thousands of years ago; though, as civilization progresses, there are improvements in materials, and in the technique of their application to design. Despite this fact, the important methods by which objects were ornamented in days of antiquity are still the methods remaining in use today. They are four in number, and speaking in broad terms, may be classified as: (1) contour enrichment, (2) carving, (3) painting, (4) inlaying. Contour enrichment has already been treated, though a few additional aspects of it will be touched upon in a following article. The remaining three methods of ornamenting objects, together with rules for their application to design, will be treated in this and the following articles.

The sources of ornament for surface enrichment are three in number. They may be selected from abstract forms, naturalistic sources, or artificial objects.



Abstract motifs are derived from geometric sources, and consist of borders, moldings, inlaid bands; or applied ornament such as bosses, lozenges, dentils, etc. Many of these are found on furniture designed before the eighteenth century. On objects made of clay they may consist of geometric all-over patterns, either carved or painted under the glazed surface. On wood, a notable example of the effective use of abstract design is chip carving, a form of ornament that has wonderful possibilities if well handled. At A in Figure 25 is shown a small chest decorated with chip carving. The panel shown at B is carved with Gothic tracery. This is still another form of abstract ornament. It would be difficult to mention all of the interesting possibilities of this source of ornament, even as it may be applied to the enrichment of objects made of wood.

In the first article of this series, entitled "The Division of Masses," abstract ornament was shown adapted to objects made of wood and iron. The panels of the chest were ornamented with moldings formed into patterns of geometric form. All of the ornament on the andirons falls under this classification. Again, in the article on "Proportion," this form of ornament was shown adapted to an object of clay, namely, the fern dish. The hardware on the desk (Fig. 26), shows it adapted to an object made of brass.

Naturalistic motifs are derived from things found in nature. They may be divided into several groups. Under the first group, we have those of human or animal origin. These consist of busts, animal heads and feet, griffins, cherubs, etc. An example of these are the ball-and-claw feet, a favorite motif on Chippendale furniture. Figure 26 shows a beautiful desk of Chippendale design, the carving on which is mostly of naturalistic origin. The ball-and-claw feet are well designed

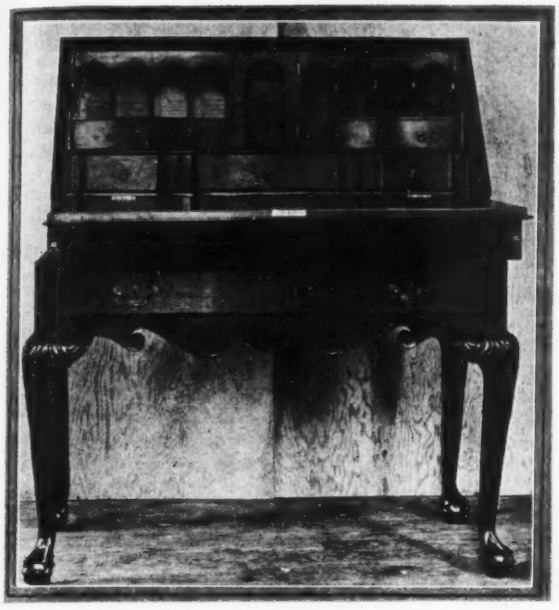


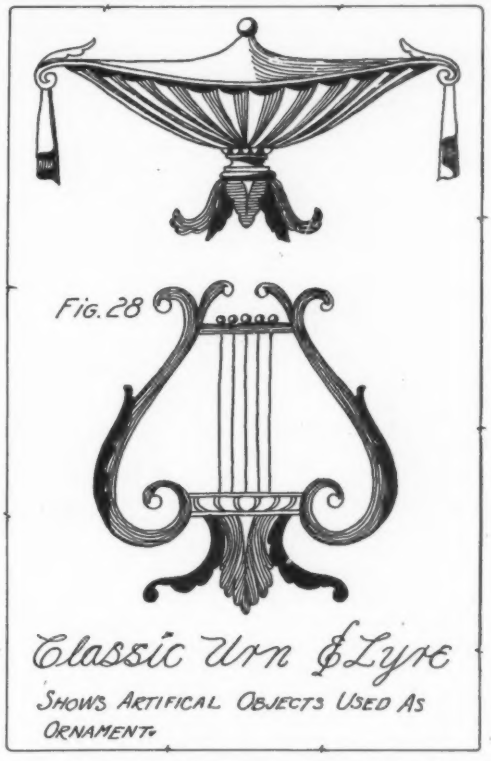
Fig. 26. Chippendale desk

and beautifully executed, a thing possible only where the carving is done with hand tools. Other examples of this first type of naturalistic motif are busts of famous people, such as are sometimes used for finials in the break of a pediment on a tall cabinet or secretary; cherubs painted or inlaid on panels, etc.

A second group of naturalistic motifs consists of those derived from plant life. These consist of carved leaves, especially the acanthus leaf, palm or olive branches, the honeysuckle, and others. Most of these are of classic origin, and are conventionalized to make them suitable for ornament. The beautiful and appropriate carving on the knees of the desk (Fig. 26), gives ample evidence of the wonderful possibilities of motifs in this class. During the period of Louis XV, French designers let their imaginations run riot, and attempts were made to copy nature as it was found, and in some cases to outdo it. The outcome, in extreme cases, was a bewildering maze of ornament that degenerated into bizarre effects, and resulted in objects of little or no beauty. In some cases the ceilings, walls, woodwork, and furniture, were carved, gilded, painted, and otherwise ornamented, causing people of good taste to rebel against the extravagant and vulgar display. Too much ornament, no matter how beautiful individual elements comprising it may be, is far worse than none at all, and like too much sugar in the coffee, is a thing to be avoided. A little ornament, carefully chosen for its appropriateness, and well executed at the right place, will result in objects of distinction and elegance.

The third group of naturalistic ornament consists of rock-and-shell motifs, or rococo ornament, as it is commonly known. This originated in France during the reign of Louis XIV, and was developed with great skill by artists and designers during the reign of Louis XV. Chippendale was influenced somewhat by it, and used motifs of this kind on, what he termed, his best furniture. It is a form of ornament peculiarly suited to design using the principle of occult balance, and where very rich effects are desired. Figure 27 shows a piece of hardware on which a motif of this kind has been used with interesting results. It is a type of design suited only to the very richest settings, and should not be attempted under any other conditions.

The third major source of ornament for surface enrichment comprises artificial objects, and includes motifs such as vase forms, musical instruments, ribbons and love knots, and a large assortment of kindred subjects (see Fig. 28). Most of the elements in this group are of classic origin, and were used



with great skill and good effect by later eighteenth-century designers. They were especially suitable for inlays, and were much esteemed for this purpose by the Brothers Adam, Hepplewhite, Sheraton, and contemporary designers. The Brothers Adam introduced the vogue for ornament of classic origin, and brought it to England, whence it spread to France and America. In our country. Duncan Phyfe used motifs like the lyre, Prince of Wales feathers, and others to excellent advantage. The advantages of using inlaid ornament were that it permitted a much lighter, more graceful structure, colorful artistic effects, and, of course, satisfied the desire for something new. Where a saving of expense was necessary the designs were painted instead of inlaid.

The foregoing, then, comprise the chief forms of ornament for surface enrichment, classified in a manner to make an intelligent selection of motifs possible. The next article will continue the discussion of ornament from a different angle: that of its applications to the design.

Hobby Hints for Hobby Hunters

Max Chambers

Public Schools, Federalsburg, Maryland

In this, the fourth article on hobbies, the author enumerates the avocational interests of historic and well known personages.

THE privilege of having a hobby has just recently come to the common people, for, like all profitable activities, the hobby was once the sacred outlet for the energy of kings and princes. The ancient Egyptian kings were especially favored and well versed in their choices which have come down to us as monuments of their devotion to a hobby. The famous Chinese porcelainware and jade carving represent the full realization of an early avocation of the Chinese. The early Javanese buffalo hide shadow shows of legendary history are the forerunners of the present-day silhouette craze, and the famous metal work of India is the ultimate development in a quest for expression or emergence.

King Solomon's hobby was the building of the temple, the story of which is fully recorded in I Kings and II Chronicles. The Greeks had a hobby of athletics which was really a part of their national defense, and the Romans had their chariot races. With the successful expedition of Columbus, exploring and pioneering became a world hobby. In England, archery was the choice of the kings until the blunderbuss was invented; then they changed to hunting. Henry VIII's hobby seems to have been wives who lost their heads. The hobby and joy of life of the American Indian was scalping, probably the most cruel of all the collection instincts.

The early American hobbies for the grown-ups were shooting matches, wrestling bouts, battles royal, hunting, sailing, dancing, walking, racing, cockfighting, camp meetings, log rollings, "hoss" swapping, fish gigging; and for the women, spinning, carding, knitting, quilting, and sewing matches; for the children, collecting skins of small animals, arrowheads, pebbles, playing "Ant'ny Over," "Chase the Cherokee," and reciting Bible verses.

George Washington's hobby was breeding fine horses and foxhounds. Benjamin Franklin's was science. Daniel Boone's was hunting, exploring, and woodcraft. Andrew Jackson spent his leisure hours attending horse races and cockfights. Abraham Lincoln gave his spare time to reading and telling humorous stories. Teddy Roosevelt's was hunting and Woodrow Wilson's, reading. Calvin Coolidge loved his Vermont Hills.

Today old books are a favorite. The Folger Shakespearean collection, recently established in a fine new building opposite the Library of Congress in Washington, is probably the finest in the world. Folger spent his lifetime on this hobby. Washingtoniana and Lincolniana in many forms are being followed by thousands. The famous Parma Liturgical Library in Paris was recently sold, it being the first sale of its kind in 115 years! It was the hobby of the duke, his son, grandson, and greatgrandson!

The most widespread of all hobbies is philately, which is usually started on a salvage basis in boyhood. At the 1933 International Stamp Show more than $9,000,000 worth of old and rare stamps were shown. The most valuable was the 1856 British Guiana stamp owned by an American. It is worth $50,000. Thousands of American boys have gone philately because stamps are comparatively easy to get and they teach language, arithmetic, history, geography, and art. A man in Iowa made a serviceable walking cane from canceled stamps.

And still more thousands have radio for a hobby. It might be truthfully said that practically all of the important developments in radio reception have come from the amateurs, of whom there are some 35,000 in the United States.

Daniel Willard's hobby is his B. & O., though occasionally he plays his fiddle. Chauncey Olcott collected wooden cigarstore Indians. Richard Harlow, of Western Maryland College, has 30,000 bird eggs in his collection! Tony Sarg owes his success to the "pull" he had with the marionettes. Dr. Robinson, president of the College of the City of New York, changes hobbies every year, and another New Yorker named Kennedy has played on more than 1000 different golf courses.

Thomas A. Edison's lifework came from an avocational interest developed by a great mind, though discouraged by the big foot and heavy hand of an irate railroad conductor. In fact, all culture appears to have come from avocational efforts to satisfy the wish complex. Fortunate, indeed, is the person who has a coworker who can help him in high-grade wish formation. Most of the great present-day inventions have come from men trying to find relief and relaxation. This is more true today than ever, but is probably losing ground to the "Spawn Shops" where research workers systematically "spawn" answers to many complex problems. The hobby is man's best catharsis and is the most democratic American industry or institution, for no other activity gives more freedom. It has given many a man a new outlook on life and an elevator to success and is often the difference between release and happiness.

John D. Rockefeller, Sr., has several avocations — philanthropy, golf, and giving away new dimes. Luther Burbank's almost unbelievable changes in plant life came from a hobby, and Henry Ford has set up at Dearborn and Wayside Inn his collection of Americana which cost him $15,000,000, every dollar of which was made from an industry built on a hobby of mechanics!

The best art galleries in the country have come from the financial ability of great Americans to pacify a yearning for soul-stirring experiences. The Field Museum in Chicago, the Corcoran gallery in Washington, and the Epstein and Walters collections in Baltimore bear this out.

Charles Schwab raises fine horses. Charles Dawes plays and composes music. Charles Curtis knows the "bangtails" and both of the 1932 Presidential candidates were "wet" — at least their hobbies would prove them so. Mr. Hoover is an ardent fisherman and says that "All men are equal before fishes." Mr. Roosevelt likes swimming and collects naval prints, on which he is an authority.

Governor Ritchie plays handball but gets his greatest pleasure from "working on the job." Maryland's Senator Tydings wields a mean brush and palette. And up to a few years ago cedar whittling blocks were kept in the Capitol for senators to carve and whittle on!

A woman in Philadelphia has a collection of 700 pitchers, and another in Wyoming has 800 snail shells. A woman in South Carolina catches snakes and one in Illinois has a herd of cats. J. P. Morgan collects and studies American Church history. Thousands of people keep scrapbooks and more thousands are soothed by music in its many forms. Gifford Pinchot gave most of his early life over to reforestation. Throughout the land almost every vacant lot and field holds its quota of young and old horseshoe pitchers and baseball players. And one man has run 3,000,000 women crazy! Anyway, they are playing bridge from yawn to yawn!

Down in Florida a new industry is developing out of a hobby of catching reptiles. They are canning rattlesnake meat and selling it at $4.60 a can! Oriental rugs are the specialty

of Walter P. Chrysler, and Henry L. Stevens, Past National Commander of the American Legion, is a deep-sea fisherman. A man down at New Market in the beautiful Shenandoah Valley of Virginia has been riding his hobby for 20 years. He has the largest collection of buttons in the world, thousands and thousands of them, and no two alike. And talking about historical buttons — ask him when you are down that way.

A smoking club in St. Louis papered its clubroom walls with cigar bands, Kate Smith brand. Louis XVI of France, among other things, tinkered with locks; and from a boy, Charley Courtney had a definite interest in lock construction, a hobby which later developed him into the world's premier locksmith, who salvaged gold from the huge treasure chests of the sunken liner Egypt. Bill Hart, famous wild-west movie actor, collects firearms and porcelains. King Prahajipok of Siam is an amateur photographer. Montagu Norman, Governor of the Bank of England, studies birds and collects panels. Dr. Ditmar, of the New York Zoo, America's reptile expert, catches snakes — mostly at night — in the tropical jungles. Borah Minevitch, harmonica impressario, filled his own sails and blew his way to fame. You can never tell where a good hobby will land you! Clyde McCoy, NBC orchestra leader, has collected 223 pipes. The hobby of Gustavus Wynne Cooke, of Philadelphia, is photoheliography (whew!). And from a hobby of telescope building, Russell W. Porter of Springfield, Vermont, has developed into a telescope master, working on the huge new 17-foot California "spyglass" by special invitation.

And strange as it may seem, an Eastern Shore Marylander has discovered H. L. Mencken's fortissimo and his hobby — he performs extremely well on the piano. Dr. William Welch, Dean of American Medicine, is an expert chess player and swimmer at 82. Another man in Baltimore collects pennies. He has one for every year since 1794 except 1815 when none were minted; and down at Chapel Hill, the seat of the University of North Carolina, E. W. Neville hasn't been late at or missed church for 22 years!

Every great American has his avocation and thousands of schoolboys have their hobbies. Do you have some small enthusiasm in which to lose yourself? If you do, you are growing — if not, you have a special invitation to join the great Triple H Club. Happy Hobby Hunters — join the hunt today. What will you ride?

Pottery and the Potter's Wheel

R. H. Jenkins

Professor, Industrial Education,
Humboldt State Teachers' College, Arcata, California

An interesting article on the rudiments of the potter's art. The author describes the making of the potter's wheel, thus making the adoption of pottery work as a school subject or as a hobby very inexpensive.

WE ARE at the threshold of a new era, and our economic life is rapidly changing. What the coming years may bring forth is hard to predict, but one thing is seemingly quite evident, and that is that the hours of work are to be shortened. This will leave a much larger proportion of time for leisure, and the manner in which this leisure time is used is vital to all. Boys, both young and old, should have some avocation, some hobby which can be followed with interest and profit to themselves. These hobbies may be many and varied, depending upon the tastes of the individual, but if the boy or girl is undecided, the teacher should be a real help in offering suggestions.

The writer has had so many inquiries concerning possible inexpensive lines of industrial work, which might be interesting and not too hard, that he wishes to take this opportunity of offering at least one of many possibilities. The line suggested here may be used as a regular eighth-grade and high-school project, and as a hobby.

About a month ago an upper-grade teacher wrote for details on the expense of a potter's wheel, the methods of using it, and the possibilities of a boy learning to operate one. There is no reason why any intelligent boy or girl might not learn to throw pieces upon a potter's wheel if he or she desired to do so, and had the patience to stay on the job. It is not so much harder to learn to use than any other machine, and has the advantage of being perfectly safe. The wheel is also a type of machine which any handy boy can build. The simple sketch in Figure 1 may be used as a guide.

The Clay

If possible, a good bed of clay should be located before beginning the work, as considerable expense can be saved in this way. There is also an added zest to the work if the individual mines his own material. There is nothing so very mysterious about a good potter's clay, and such clay does not have to be purchased to insure its usability. Of course, if there is no bed convenient, the clay may be purchased from any reliable dealer. A good clay for throwing should be fairly plastic (sticky), and should be worked up until it is uniformly soft and smooth in texture. If it is to be fired very hard, it should be tested to see if it will stand up under the high temperatures, and if it is to be glazed, it should be tried to see if the glaze will fit. However, in this article the writer plans to give details for a simple pottery which does not need

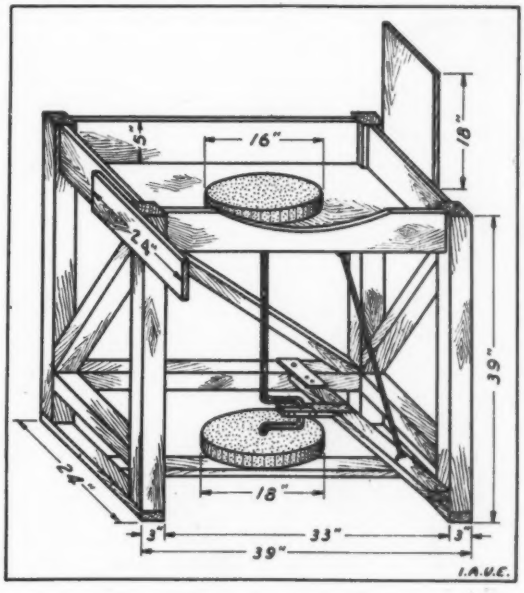


Fig. 1. Homemade potter's wheel

to be glazed to be effective, and in which the ordinary heats are used. If, therefore, a good clay bed can be found, do not hesitate to use it. Simply dig off the surface overburden, take out what good clay is needed for several months, and find a joy in the pleasure of producing. The dug clay should be kept dry and then soaked up when needed. Dry clay will go into solution easily, and may then be piled out on a board to stiffen.

Throwing

Prepare a ball of clay about the size of an indoor baseball. Fasten it with a little soft clay to the plaster head of the wheel, as shown in Figure 3. Press down the clay as shown in Figure 2, and after studying Figure 4, try to center the mass. The centering is very important, and should be practiced over and over until it is thoroughly mastered.

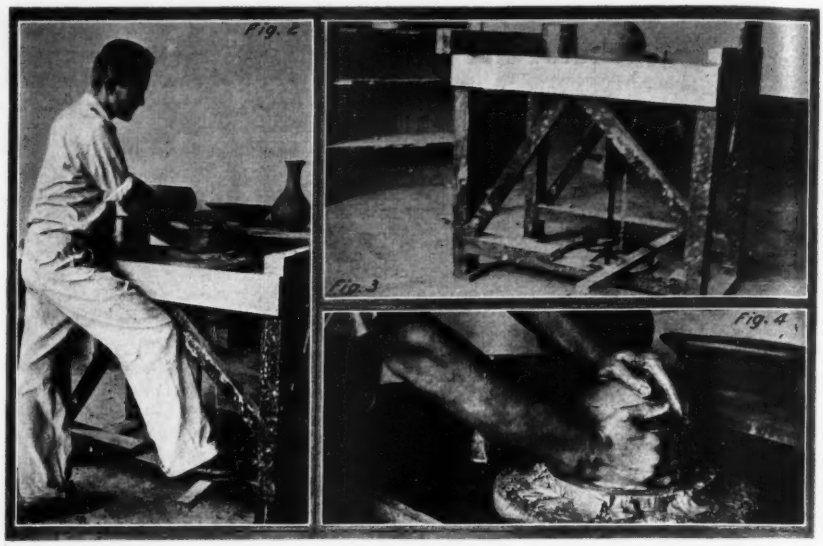


Fig. 2. The boy at the wheel, pressing down the clay to fasten and center it upon the wheel head. Fig. 3. The wheel with the mound of clay. Fig. 4. Centering the ball

To center well, the operator must first know how to kick the wheel properly. Practice kicking the wheel, therefore, until that act seems natural, and then commence on the ball of clay. Run the wheel from right to left, or counterclockwise, and run slowly, not over 150 revolutions per minute. Have a bucket of water conveniently near, and keep the hands moist at all times. Press the mound of clay firmly into the center of the wheel. Brace the left arm against the body, and with the left hand push steadily against the ball of clay. Place the right hand over, and nearly opposite the left and pull and press down upon the clay. This process pushes the clay to the center of the wheel and at the same time forms it into a small dome-shaped mass. Use plenty of water on the hands.

The next step is to draw the mound up so as to force out any air pockets, and this process is clearly shown in Figure 5. It is done by holding the hands on opposite sides of the ball, pressing against it with the lower edges of the palms and slowly raising the hands. This process draws the clay up into a tall slender cylinder which must again be pressed down upon the wheel head. The pressing-down process is done with the right hand using the left to steady the mass and make it again form a mound in the center of the wheel. This mound is now made approximately the size around of the finished piece.

Study Figure 6, then with the thumb of the right hand drill a hole in the center of the mound, commencing at the top, and going to within ½ in. of the wheel head. The ½ in.

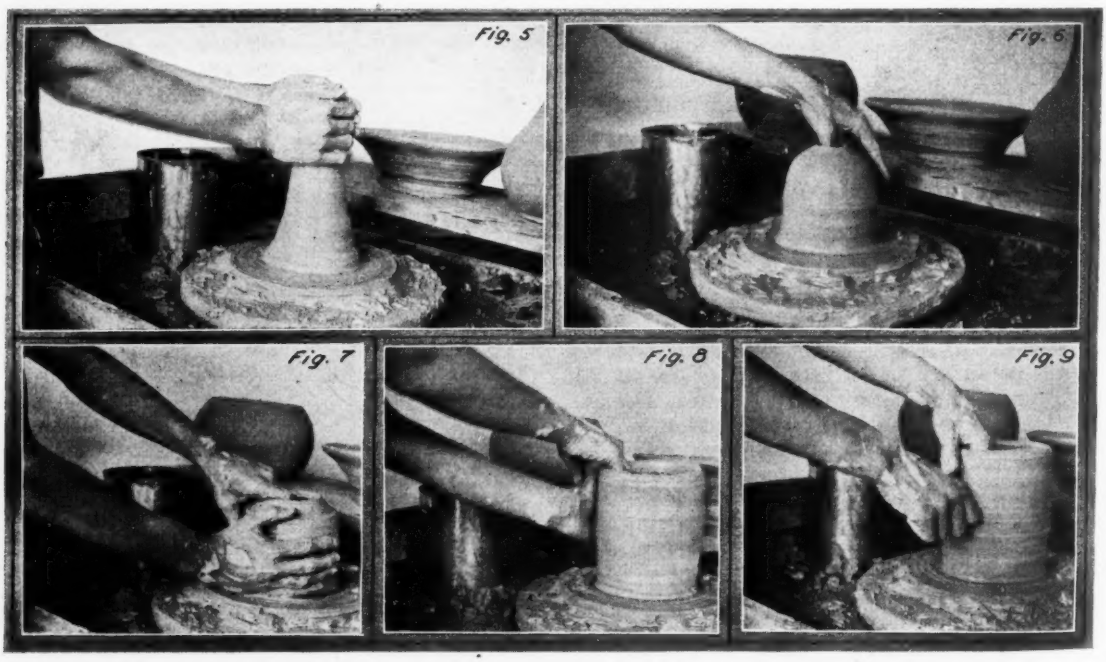


Fig. 5. Drawing up the clay to force out air pockets. Fig. 6. Making a hole in the center of the mound. Fig. 7. Enlarging the hole with the fingers. Fig. 8. Drawing up the sides to make the cylinder. One method. Fig. 9. Drawing up the sides to make a cylinder by another method

of remaining clay is for the bottom of the piece. Insert a finger or two and gently pull outward so as to enlarge the hole drilled with the thumb, as shown in Figure 7. Try to make the hole have straight sides, and keep the top edge smooth and even. Keep the thumb of the left hand resting gently upon the upper edge so as to aid in keeping that edge straight.

To center the hole, place the left hand on the outside with the palm resting gently against the clay, and the fingers of the right hand on the inside opposite the left, with the thumb of the right resting on the outside of the left (see Fig. 8). With the hands held in this position, gently force the soft clay into a uniform, thick ring or cylinder. With the hands still in this position commence the process of drawing up the sides of the cylinder in order to form the proper thickness for the finished piece.

While the wheel is slowly turning, press in gently but firmly from the outside with the left hand, and at the same time hold the pressure with an even force from the inside with the right hand. The tips of the fingers of the right hand should be opposite the left hand and pressing near the lower part of the palm of the left. The thumb of the right hand should still rest as a guide on the back of the left. In this position, slowly but very evenly, raise the hands and draw the clay upward.

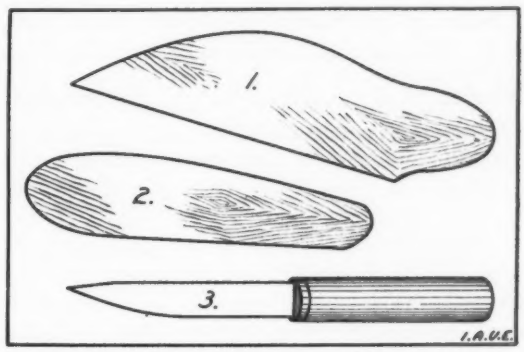


Fig. 11. Tools used in throwing. (1) Outside rib, made of copper, steel, or wood. (2) Inside rib, made of the same materials. (3) Sharp pointed knife for trimming edges

Fig. 10. Forming the bowl. Fig. 12. Using a rib to scrape true the outside. Fig. 13. Truing up the edge with a knife. Fig. 14. Suggestive forms which are not too hard for the beginner

Keep the upward motion to the very top of the piece, and then hold the hands at the edge until everything is running true. Lessen the pressure as the top is neared so that the edge will not grow too thin.

This process should be repeated over and over until a cylinder is made with a wall about ½ in. thick and as tall as the clay will permit. No matter what the finished piece, a simple cylinder is first made so as to establish the thickness of the walls. It is beneficial to have this cylinder taper slightly in toward the top, rather than out, and to be a little thicker at the upper edge than too thin.

The surfaces of this cylinder may be scraped perfectly true with a piece of tin, copper, or wood cut to fit the purpose, and the edge trued up with the point of a knife. The scraping tool is called a rib, and can be cut by the worker into various shapes to fit the curves of his work. Figure 11 shows the ribs and knife used at this stage of the work. In Figures 12 and 13, the student is shown using the rib and knife to true up a nearly finished piece.

Another method of drawing up the cylinder is shown in Figure 9. In this process the right hand is on the outside and the left hand within, and instead of the palm of the right being used, only the index finger is brought into play in such a position that the first and second joints come against the clay. The fingers of the left hand are on the inside exactly opposite the right, and the thumb of the left rests firmly against the wrist of the right. With this position, the drawing-up is carried on through the same steps as directed in the first process.

To complete the throwing, either process may be used, or still better, use a combination of the two. For a bowl, press in at the bottom from the outside, and from the inside out, toward the middle, and at the top from the outside in again (see Fig. 10). In other words, the hands follow the shape in the mind of the worker.

It will be better to make a bowl at first, and the student must not be discouraged over his first efforts. Usually there are two difficulties. Generally the clay is handled too roughly or the mass was not perfectly centered. If the cylinder is too large around, the diameter may be reduced by the same method that was used to force the air pockets out of the clay.

The work may now be removed from the wheel by sliding the board off the plaster head. Before setting aside to stiffen, a wire should be run under the piece close to the board to cut the clay loose and keep it from cracking and drying. When leather-hard, the bowl should be ready for turning.

INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

J. J. Metz, Editor

The A. V. A. Convention at Pittsburgh

Teachers, supervisors, and directors of industrial arts and vocational education will have a good opportunity to discuss and probably settle some vexing problems which now trouble them, at the American Vocational Association Convention to be held in Pittsburgh, December 5 to 8. This will be possible only if those interested in the solution of these problems attend this convention and enter freely and whole-heartedly into the discussions there held.

Every profession is judged, more or less, by the interest displayed by its members in the solution of common problems, in the raising of existing standards, and in the improvement of the service rendered by the profession. None of these things can be looked upon as being the work of a single individual or of a small group of individuals. The common good demands that all should help. It is necessary, therefore, that everyone interested in industrial arts and vocational education be in attendance at this convention if that be at all possible for him.

Of course, attendance at Pittsburgh will necessitate the expenditure of money which cannot be spared readily. Such sacrifices, however, must be made if the work for which the American Vocational Association stands is to flourish and advance.

Besides the advancement of common interests, the convention at Pittsburgh offers a not-to-be-overlooked opportunity for visiting a city which justly can be proud of a school system offering much to those who are interested in industrial arts and vocational education. Then, too, industrial Pittsburgh contains much that will be helpful to the man who is looking about for related material with which to enrich his instructional material.

Pittsburgh with all of its advantages, and the American Vocational Association with its offerings, are beckoning you to attend the convention December 5 to 8. It is for you to decide whether or not you can afford to ignore the invitation.

Determining Why and What

It is encouraging to note that those interested in industrial arts the country over, are expending increasingly more effort and thought on determining just what forms the basis for this particular type of work in the schools and what should be included in the work offered in order to make it most effective.

Probably the latest attempt at finding the solution to these questions is the study just published under the title *A Prospectus for Industrial Arts in Ohio*. This broad and forward-looking pronouncement has been sponsored jointly by the Ohio Educational Association and the Ohio State Department of Education. It is the outcome of a desire to develop a forward-looking program for the state mentioned, but as one reads the prospectus, it becomes evident that by its very nature it establishes the essentials of a program which is more than state-wide and even more than nation-wide.

While the committee that is responsible for the writing of this prospectus would naturally disclaim the idea that it had produced something entirely new, nevertheless the readers of the prospectus must admit that the arrangement and organization of the material in the booklet are quite effective and that it will do much in clarifying for those interested in industrial-arts work the ***why***, the ***what***, and the ***how*** of an adequate industrial-arts program in our modern program of education. In the section of this booklet entitled *Professional Antecedents*, the superintendent, principal, supervisor, administrator, board member, teacher, parent, industrialist, business man, professional man, all may find definite reasons why industrial-arts work should and must be a part of general education. The prospectus shows that these antecedents are merely the sources or channels out of which springs the necessity of making the industrial arts the skeleton which supports the flesh and blood of a general education for the boy and girl for our present-day civilization.

Strangely, and yet not so strangely, either, knowing as we do that anything developed by man grows to its maturity at a painfully slow pace, the Ohio committee has been able to substantiate practically every one of its statements from the written word of educational thinkers who have wrestled with the problems confronting educators from the very dawn of civilization down to the present time.

It is studies like the one contained in this prospectus that will definitely establish the place of the industrial arts in our schoolwork and will give it the prestige which it deserves. If the crisis from which we are now emerging will have accomplished nothing more than to produce such serious study of educational questions, it will not have been in vain.

The Radio and Education

More and more is central broadcasting equipment found in the school. This is a hopeful sign, because education, to be as efficient as possible for our present type of civilization, should make use of every aid that science can place at its disposal. With this equipment at hand, the principal can communicate at will with one or more, or all of the classrooms in his school. More than that, special features such as, for instance, an address by the President of the United States made during the school hours may be made available at once to the entire school. In the same way, the school may receive special programs from nationally and internationally famed artists, statesmen, explorers, and famous personages.

This covers the commonly accepted use of the radio in the school. The radio, however, is equally helpful in furthering education when the regular broadcasting channels are used in enlightening the public about various phases of the work offered by the local school system, or through some national enactment.

For this purpose the school has not as yet used the radio as much as it might. It is true, here and there, series of talks have been given over the radio, explaining what the school is doing or proposing to do in one or the other subject which it is offering.

Mr. J. I. Sowers, Director of Industrial Arts, Miami, Florida, has done some notable work in using the radio to make the people of his state realize the value of industrial arts in the school. His example ought to be followed elsewhere. As a matter of fact, educators ought to use the radio much more in this promotional work because the social-economic changes make changes in educational material and method equally necessary, and this, as the last few years have demonstrated, means informing and educating the public.

Then there is another field in which the radio can be used, and that is in the athletic work which now makes up a considerable part of the extracurricular activity of the junior and senior high school. A good broadcasting system at the games and field-day events will do much to make attendance at these more enjoyable for the onlooker. At the same time, the preparation and erection of some of this broadcasting equipment can be made part of the electrical-shop course, thus giving the shop one more opportunity to tie up its activities and accomplishments with one other branch of the school's activity.

The portable amplifier by Francis J. Coyte of the Clifford B. Connelley Trade School, Pittsburgh, Pa., which is described elsewhere in this issue, is an example of how radio may be used in this way. Visitors at the coming American Vocational Association Convention will have an opportunity to see this equipment which has done a great deal to sell the electrical division of this great trade school to its entire student body. The project of building it has done more, however, by giving the students of the electrical division a keen sense of accomplishing something out of the ordinary besides giving them a better grasp of the principles of electrical sound transmission through that mysterious invention of this age — the radio.

That Precious Eyesight

In a release by the National Society for the Prevention of Blindness, Dr. Wilkinson, writing on "Eyesight in Mental and Physical Development," discusses the eye defects and their effect on personality and character of both the nearsighted, and the farsighted child.

He shows that the nearsighted child becomes an introvert, because his eye defect makes him an unwanted entity at baseball, basketball, and other games of this type. Not fitting in with his schoolmates at their games, the nearsighted boy may develop an inordinate desire for reading, thus leading an indoor rather than an outdoor existence, and gradually living entirely in a world of unreality and thus becoming an unbalanced individual.

Not being able to excel in games, he takes satisfaction in making intellectual advances, and as a defensive measure becomes contemptuous of his normal and more motor-minded classmates. Gradually he becomes accustomed to depend entirely upon himself for his own entertainment and thus develops habits which make it exceedingly difficult for him to adjust himself to his surroundings, becoming one of those individuals commonly classed as eccentric or as disagreeable.

The farsighted child, on the contrary, excelling at those things which do not require the adjustment of the eye to the extremely small things, or those that are very close to the observer, is affected by his eye defect in just the opposite way. His eyes will not focus readily on the printed page without producing a state of strain; hence, he will not be attracted to reading or to study but will naturally choose those activities that give him least eyestrain. In his schoolwork he may appear dull, and the teacher may call him lazy, but out of doors he excels in games and athletic pursuits.

Both of these types of boys are found in the school shop, as they are found in the other schoolrooms. The shop teacher, however, gets into much closer contact with his pupils, than do the other teachers, and if he is alert, he can discover frequently the real reasons underlying the behavior of some of his students.

If discovered in time, these eye troubles may be corrected with properly fitted glasses, and a boy who might develop an unsociable character, may become a useful and likable citizen.

The National Society for the Prevention of Blindness is doing very fine work, but it needs the co-operation of others in order to succeed. Teachers, especially shop teachers, should do their utmost in helping to combat blindness and the results due to eye defects by calling the attention of parents and school authorities to the needs of their students. Here as elsewhere, corrective treatment started at an early age, has a good chance for doing good. If neglected, however, the results may produce effects that may wreck the happiness of not only one individual but probably of many.

The Christmas Spirit

With the Christmas season almost upon us, it may be well for the shop teacher to cast about a little for something that he can contribute to make the lives of his students a little more cheerful.

It need be but a trifle. There is so little cheer in so many families right now, that the expression of just a little extra good will may mean a great deal.

In the busy lives of the teachers, there may be little time for doing much extra planning, but a little time spent on producing some simple remembrance, probably insignificant in itself, yet bringing a glow of warmth into a youthful heart that might otherwise feel cheerless and friendless on Christmas, the feast of joy, will be time exceedingly well spent.

Block Prints from Photographs

W. Ben Hunt

Hales Corners, Wisconsin

This is an illustrated article showing, step by step, just how to prepare photographs to serve as bases for block-printing illustrations.

IT IS sometimes difficult to say from a casual glance whether a block print is printed from copper, zinc, wood, rubber, or linoleum. Those made on metal are usually produced by the photoengraving process and are exact reproductions from drawings, or as is sometimes the case, from a block print itself. This latter method is used when a large number of impressions are wanted, as, for instance, for greeting cards, for ads, or in the publication of books or magazines.

Fig. 1. Halftone of the original photograph of a log cabin

Fig. 2. The retouched photograph

Block prints, for best results, should be pulled or printed by hand from the original block. The purpose of this article is to show how one may prepare a photograph so that it will be suitable for block print reproduction.

Occasionally, every photographer finds among his prints one that is quite different from the general run of photos: one that at first sight shows promise of making a good block print. Probably it has dense shadows, such as are seen in winter scenes with whites and blacks. It is these that are required, as the grays and the half and quarter tones cause trouble.

To make a block print from such a photograph, take the desired print as it is (see Fig. 1), or make another one on contrast paper, and mount it on cardboard to keep it from curling. Then with black water color (lampblack or ivory black) go over the darker portions of the photo as is shown in Figure 2. Do not, however, obliterate the outlines. They must show.

After all the darker portions have been treated in this manner, the white portions must be worked up. This is done with chinese white. Go over these lighter portions carefully, because every part of the picture must be either solid black or pure white. Remember that the white portions must be cut out later hence keep them simple.

Now set the picture up somewhere and look at it from a distance. If a little more white or black is needed here and there, put it in. The copy is then finished, and should be as nearly correct as possible.

If the picture is the correct size for the block, you are ready to go ahead, but if not, an enlargement should be made. The simplest way to get this is to have a photostatic copy made of the picture. See Figure 3. If there are no facilities to have one of these made, have a regular photographic enlargement made first, and then do the retouching on it. The author prefers retouching the small print, because then if it turns out contrary to expectations, the loss is not quite so great.

Fig. 3. Photostatic enlargement

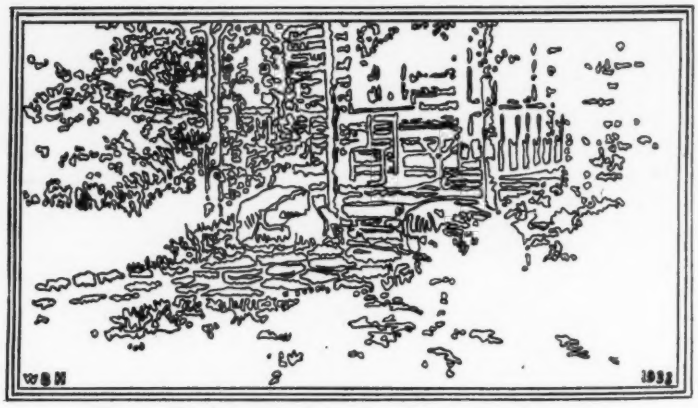


Fig. 4. Tracing made from the photostatic enlargement

Now fasten, with clips, a piece of tracing paper over the drawing, and with a finely pointed 1H or 2H pencil, outline every bit of the work. Figure 4 shows such a tracing. Before this, you have, no doubt, decided on what medium you wish to work in. No matter what it is—wood, linoleum, or rubber—it should have a light-colored face. If it has not, wash a thin coat of white water color over it and let it dry thoroughly. Fasten the tracing face down on the block and rub it carefully, lifting one corner at a time to see if it has been transferred evenly.

The cutting is next in order. There are different ways of cutting the various materials. Wood and linoleum are usually

Fig. 5. The block print. Original print is 8 1/4 in. wide

Fig. 7. Photostatic enlargement of the retouched photograph

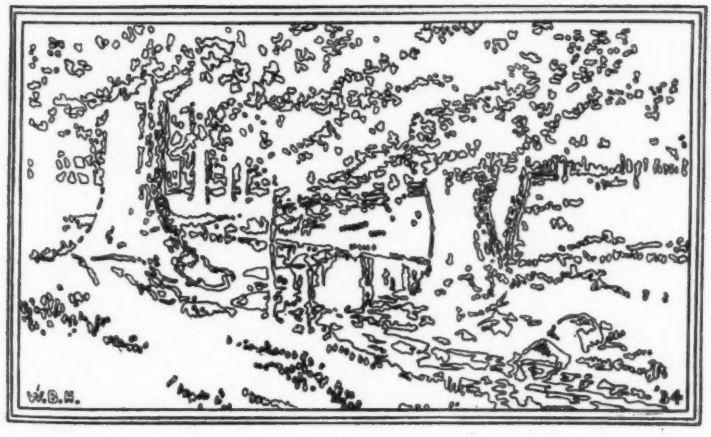


Fig. 8. Tracing made of the enlargement

Fig. 6. The retouched photograph of the babbling brook

cut with gravers' or carving tools, while the rubber, which by the way is a specially prepared product made expressly for this work, is usually cut with a sharp, thin-bladed knife.

The white parts of the picture are, of course, the ones to cut out. If the outlines are followed with care, the finished print should be exactly like the copy or sketch, with this difference: there is a certain freedom of line which cannot be obtained in any other way.

The method of printing depends upon the methods which are at one's disposal. A printers' proof press, whether it be the old Washington hand press or the modern roller proof press, is, of course, the best. If none of these are to be had, a common letter press, such as was formerly used to copy letters, will do nicely. Use enough ink, and see that there is an even distribution of pressure. This may be done by pasting thin sheets of paper on the back of the material or of the block, if it is mounted, directly below the low parts, which appear gray on the print. Figure 5 shows a print made from the finished block.

Figures 6, 7, 8, and 9 show the retouched photograph, the photostatic enlargement, the pencil tracing, and the finished block print made of a small photograph showing an interesting little brook meandering through the cool shades of a little woods.

Fig. 9.
The block print

Common Woodworking Tools—III

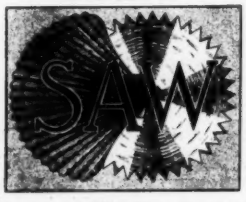
E. M. Wyatt

West Technical High School,
Cleveland, Ohio

The third of a series of historical sketches of the development of woodworking tools.

THE SAW

AN IMAGINATIVE writer has opined that the scallop shell was man's first saw, and his second, a nicked stone. Primitive man probably used such crude tools, but, if so, he probably thought of them as badly dulled knives. The saw probably developed from the knife, but from a bronze one, not a tool of the Stone Age. As far as we know, the Egyptians were the first users of the saw. They had these bronze tools as far back as 4500 B.C.



The Egyptian's saw, (Fig. 26), looked much like a large modern bread knife with a tapered blade, straight or slightly bent handle fastened to the blade by a tang, and teeth cut without rake or set. The teeth must have been hacked in with a stone, as the Egyptians, and later even the Greeks, did not have metallic files. In the later Egyptian dynasties, the teeth may have been cut by iron chisels.

As these early saws were without set, it was necessary to use wedges in the kerfs to keep the saw from sticking. There are pictures in existence showing Egyptian workmen using these large knifelike saws in ripping out boards from logs set upon end and held in place by ropes. The Egyptians also had small saws for small work, but they were all very much alike in form. The teeth of the saws had no rake, but from the stiffness of the blade and the tang fastening of the handle, we conclude that the Egyptian saw cut mostly on the push stroke as does our modern handsaw.

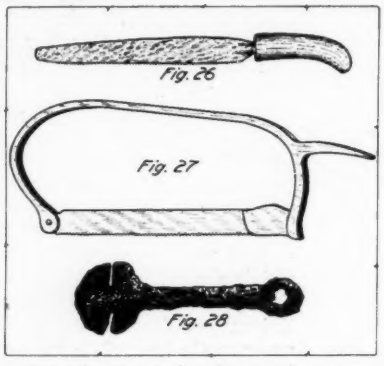


Fig. 26. Egyptian bronze saw of 4500 B.C. Fig. 27. Roman bow saw. Fig. 28. An ancient Roman saw set that is surprisingly modern in form. It presents good evidence that the Roman saw did have set

Next to those from Egyptian tombs, the oldest saws we have today are some that were found at Bologna in a heap of old tools evidently gathered together about 900 B.C. None of these saws are complete, but the fragments are of slender blades that must have been used in a frame. The teeth are raked on one side for one-way cutting, but we have no way of telling whether they were intended to be pushed or pulled. The teeth were without set, as were all saws up to that time.

At a later time in Roman history, the Romans held the saw blade in a bow frame such as the one shown in Figure 27. From the slenderness of the metal of the bow and the lack of any means of tightening the blade, it may be concluded that the saw blade was pulled, not pushed, as was the case with the saws used by the Egyptians.

The saw blades found at Bologna, and even some found as late as medieval times, had no set, hence it was commonly believed that the Romans did not know how to set their saws. Saw sets like the one shown in Figure 28 and some blades with set found later on, show that the Romans did set their saws. It also is known that the Romans had files for sharpening the iron and steel saws which came into use about 700 B.C.

In later Roman times, the bow saw gave way to the buck-saw with its blade tightened by a twisted cord probably quite similar to the saw still used in this country for sawing stove wood and for cabinetwork in some European countries (see Fig. 29). They also developed the rectangular frame saw, used for a thousand years later by European cabinetmakers as a ripsaw, and the frame saw of the lumber sawyer (see Fig. 30, and B, Fig. 31).

In this age of machine-manufactured lumber, it is hard for us to realize that it was not so very long ago that boards had to be sawed laboriously from the log by hand-and-back operated saws. Yet the machine saw has not done away with

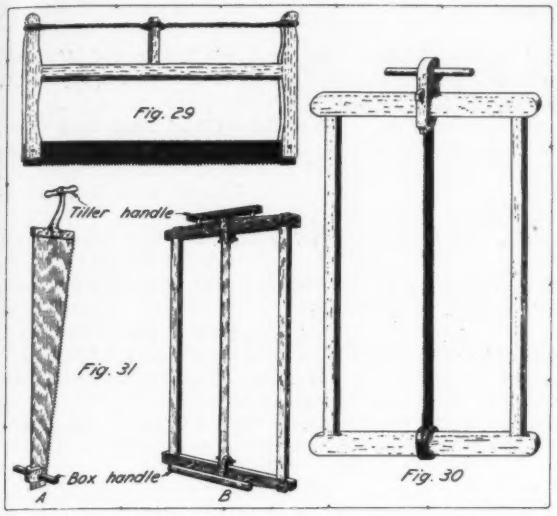


Fig. 29. A French crosscut saw of the 17th century. A type of saw still frequently used in many European countries. Fig. 30. A French ripsaw of the 18th century. Similar ones are still in use in Europe today. Redrawn from L'Art du Mensuisier, pub. 1769. Fig. 31. Pit saws: A, open type; B, framed type

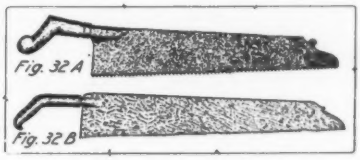
handsawing even today and there are American saw-making firms that are exporting open pit saws, of the type shown at A, Figure 31, for handsawing lumber: they may be doing so now. There are many men now living who, during the Klondike Gold Rush of 1898, carried pit saws with them beyond the Canadian frontier, for sawing logs into the boards needed in the construction of boats which were to carry them on their adventurous quest.

In handsawing lumber, two types of saws, called pit saws, were used, the framed and the open. The framed pit saw (B, Fig. 31), the older form, had a slender, fast-cutting blade, but it was cumbersome because the frame had to be taken apart whenever the blade could not be backed out of the kerf. The open pit saw (A, Fig. 31), was easier to operate, but it was difficult to make it stiff enough without making the kerf objectionably wide. Both types have handles at each end so that two workmen are required to operate them.

The log that was to be sawed was first rolled over a pit 4 to 6 ft. deep, and supported on several cross timbers. For light logs, high horses were used at times, instead of a pit, but that was not the usual arrangement. Chalk lines were then snapped the length of the log on both top and bottom. Then, with one man above and one in the pit, the laborious job of working the pit saw up and down began. As supporting cross timbers were reached, the saw had to be withdrawn, the beam shifted, and the sawing continued. It was back-breaking toil, but man did not know of any other way to make boards until the steam- or water-driven power machine was developed.

During the Middle Ages, the woodworker seems to have known only saws of the frame type shown in Figures 29 and 30. During the sixteenth and seventeenth centuries, the turn saw was developed, thus making it possible to saw either crosswise or lengthwise.

The wide-blade saw was unknown until the sixteenth century when the wide stiff-blade open pit saw, and the forerunner of the modern handsaw, appeared. The handsaw, at first had a tang-mounted handle quite like the one shown on



Early forerunners of the modern handsaw, Fig. 32A. From the picture De Timmerman (The Carpenter) made in Amsterdam in 1718. Fig. 32B. American pre-Revolutionary War saw

the ancient Egyptian bronze saw shown in Figure 26. A picture dating from 1718, shows the handsaw pictured at A, Figure 32, with a handle that might well have belonged to a dueling pistol of that time. Incidentally, it has the useless little nib that ever since has served "to make little boys ask questions." This same type (B, Fig. 32) was used in America well up to the time of the Revolutionary War. The modern hollow-grasp, riveted-on handle was not made until about 1750, and was probably not universally used until saws began to be factory-made, about 1840.

When saws became a factory product, men made them no longer incidentally as an occasional blacksmith job, but as a lifework. They could take time to study the best shape for the blade, the most comfortable form and mounting of the handle, and the likes and dislikes of workmen; they could develop special machinery to roll out their metal, shear it to shape, grind a taper to the blade, file the teeth, and form the handles; and, more important still, they could employ scientifically trained men to conduct extensive research into such matters as the most suitable steel, the best means of tempering the blades, and how to give it the most attractive and sale-producing finish. Though the factory has not materially altered the form of the saw, it has undoubtedly greatly improved it in quality. There have been no great inventions to the saw since an unknown Bronze Age workman hacked teeth in his knife to make it cut wood faster. All of these later saw inventions have been little; polishing-up improvements that came gradually through the ages to produce our efficient modern sawing tool.

Aids for the School Shop

Carl v. Lindeman

Paw Paw, Michigan

This concludes the list of references to the sources of helpful and suggestive material.

Bulletins

Short Cuts to Power Transmission (free). Flexible Steel Lacing Co., 4607 Lexington Street, Chicago, Ill.

Grinding Wheel Information (free). Norton Company, Worcester, Mass.

The Story of Cork (free). Armstrong Cork Company, Lancaster, Pa.

Patching and Furniture Refinishing (free). M. L. Campbell Company, 2330 Penn St., Kansas City, Mo.

Natural Woods and How to Finish Them (free). Berry Brothers, Detroit, Mich.

Wood Screws (free). American Screw Company, Providence, R. I.

Facts On Soldering (free). Kester Solder Company, Chicago, Ill.

How to Use Hand Screws (free). Adjustable Clamp Co., 424 North Ashland, Chicago, Ill.

How to Fire A Furnace (free). Lumaghi Coal Co., 534 McCormick Bldg., Chicago, Ill.

Mimeograph on General Shop and Household Mechanics (50c). Dept. of Vocational Education, Lansing, Mich.

(1) *A Practical Course in Concrete* (single copy free — 25c in quantities). (2) *Concrete Improvements Around the Home* (free). Portland Cement Association, 33 N. Grand Ave., Chicago, Ill.

How to Run a Lathe. The care and operation of the steel lathe (25 cents). South Bend Lathe Works, South Bend, Ind.

Abrasive Papers and Cloths for Student and Home Craft (free). A book on the manufacturing and use of abrasives. Behr-Manning Co., Troy, N. Y.

It Began With Mummies (*How Varnish Was First Used*) (free). Martin Varnish Co., Chicago, Ill.

(1) *The Small General Shop,* Book No. 50. (2) *The School Shop,* Bulletin No. 55. (3) *Motor Mechanics Handbook,* No. 33 (free). South Bend Lathe Works, South Bend, Ind.

How to Make Brushes (free). Magnus Brush and Craft Materials, 24 Water St., Wakefield, Mass.

Bookcraft, A Book On the Repair of Books (free). Gaylord Bros., Inc., Stockton, Calif., Syracuse, N. Y.

How to Select, Use and Care for Bits (free). The Irwin Auger Bit Co., Wilmington, Ohio.

(1) *Hand Saw Chart for Wall.* (2) *File Chart for Wall.* (3) *Hack Saw Chart for Wall.* (4) *Saw, Tool and File Manual* (free). Henry Disston & Sons, Inc., Philadelphia, Pa.

Fitting the Farm Saw (free). New York State College of Agriculture at Cornell University, Ithaca, N. Y.

The Story of Rope (free). Plymouth Cordage Company, North Plymouth, Mass.

Hand Book Drillers (free). Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.

The Story of Wood (free). National Lumber Mfg. Association, Washington, D. C.

The Identification of Furniture Woods, Misc. Circular No. 66 (25c). Superintendent of Documents, Government Printing Office, Washington, D. C.

Rope and Its Uses. Extension Division, Iowa State College, Ames, Iowa.

(1) *Manufacture of a Teacher's Flat-Top Desk.* (2) *Chats on Period Style Furniture: The Brothers Adam* (free, but limited quantities). (3) *Instruction Chart for Band Saws* (free). Yates-American Machinery Company, Beloit, Wis.

(1) *Cross Cut and Hand Saws.* (2) *Silver Steel Saw for Manual Training Schools.* (3) *Saw Sense* (free). E. C. Atkins & Co., Indianapolis, Ind.

Crystallizing Finish — Bakes, Bulletin No. 8 (free). Hilo Varnish Corp., Chicago, Ill.

The Making of An Auger Bit (free). Greenlee Tool Co., Rockford, Ill.

(1) *Manual of Wire.* (2) *Manual for Carpenters.* (3) *The Experience of An Iron Atom.* (4) *Nail Chart* (free). American Steel & Wire Company, 208 S. La Salle St., Chicago, Ill.

Better Wood Finishing (free). Grand Rapids Wood Finishing Co., Grand Rapids, Mich.

Smooth-on Handbook (free). Smooth-on Mfg. Co., 570 Communipaw Ave., Jersey City, N. J.

(1) *Stanley Wall Charts,* 14 by 18. Showing use and care of tools. (2) *Tracing Sheets of the Charts for Blue-Printing,* 8 by 10½. (3) *The Steel Square Booklet* (free). The Stanley Rule and Level Plant, New Britain, Conn.

(1) *How to Make Veneered Panels* ($1). (2) *Casco Gluing Guide.* (3) *Gluing Jig-Saw Puzzles* (free). The Casein Mfg. Co., 205 E. 42nd St., New York City.

Drawing and Blue Prints of Clock Frames (free). American Chime Clock Co., 1666 Ruffner St., Philadelphia, Pa.

Use and Care of Drawing Instruments (free). Eugene Dietzgen Co., Chicago, Ill.

Running a Regal (free to instructors). The R. K. LeBlond Machine Tool Co., Cincinnati, Ohio.

File Philosophy (free). Nicholson File Co., Providence, R. I.

The Romance of Leather (free). American Leather Producers, Inc., 100 Gold St., New York City.

How to Do It Book (10 cents). E. C. Atkins & Co., Indianapolis, Ind.

Machinist Practical Guide (free). Morse Twist Drill Machine Co., New Bedford, Mass.

Pocket Handbook No. 23H (free). A handbook containing tables and handy information for woodwork. The David Maydole Hammer Co., Norwich, N. Y.

Safety Switch Catalog (including Meter Service Switches and Electrical Specialties) (free). Cutler-Hammer Co., Inc., 1323 W. St. Paul Ave., Milwaukee, Wis.

School Bulletin, No. SB-35 (free). Latest suggestions and illustrations of sheet-metal working tools and machines for school shops. Peck, Stow & Wilcox Co., Southington, Conn.

Fun With Batteries. 10 cents. National Carbon Company, New York City.

(1) *Welding of Aluminum.* (2) *Machining Aluminum and Its Alloys* (free). The Aluminum Company of America, Pittsburgh, Pa.

Aluminum, and How to Solder It. Six-page lecture (free). L. B. Allen Co., Inc., 6767 Bryn Mawr Ave., Chicago, Ill.

101 Questions About Paint and Decorating. The Lowe Brothers Co., 421 E. 3rd St., Dayton, Ohio.

An Outline History of Transportation. Fisher Body Craftsman's Guild, Detroit, Mich.

Plans and Specifications for Useful Projects Made from Masonite. Masonite Corporation, 111 W. Washington St., Chicago, Ill.

The Book of Designs and Materials. Grand Rapids Fiber Cord Co., Myrtle St., Grand Rapids, Mich.

Metal Cutting With Hack Saws (free). Full of practical points on selection and use of hack saws for different metals and cutting jobs. Clemson Bros., Inc., Middletown, N. Y.

(1) *File Facts.* (2) *Hack-Sawology.* (3) *How to Sharpen Circular Saws* (free). Simonds Saw and Steel Co., Fitchburg, Mass.

Save Money on Home Repairs (free). Sure-Grip Adhesives, Inc., Albany, N. Y.

(1) *S. A. E. Steel Specifications.* (2) *Conversion Thermometer.* (3) *Heat Range Chart.* (4) *Stewart Chart.* Chicago Flexible Shaft Co., 5600 Roosevelt Road, Chicago, Ill.

(1) *Grading of Carborundum and Alorite Brand Wheels.* (2) *Abrasives In the Service of Industry.* (3) *The Romance of Carborundum.* (4) *How to Sharpen Woodworking Tools* (free). The Carborundum Company, Niagara Falls, N. Y.

Abrasive Chart. The Porter-Cable Machine Co., Syracuse, N. Y.

Tropical Lumber for Industrial Arts and Vocational Work. Indiana Quartered Oak Co., 227 East Avenue, Long Island, N. Y.

The New Story of Ancient Wrought Iron. A. M. Byer Co., Clark Bldg., Pittsburgh, Pa.

(1) *The Story of the Lead Pencil.* (2) *Source Pages.* The American Lead Pencil Co., 500 Willow Avenue, Hoboken, N. J.

Résumé of the Activities of the Michigan Industrial Education Society. School of Education, University of Michigan, Ann Arbor, Mich.

Correct Pipe Threading Principles. National Tube Co., Pittsburgh, Pa.

Electric Wood Etching. Magnus Brush and Craft Materials, 24 Water St., Wakefield, Mass.

Art Stone Work. Dumouchel's Art Stone Co., 919 S. Westnedge Ave., Kalamazoo, Mich.

How Can I Apply Art-Fiber Furniture Weaving to My School. Grand Rapids Fibre Cord Co., Grand Rapids, Mich.

Syllabus On Archery (free). Harold & Stahle, New Cumberland, Pa.

Sample Materials

Samples of Aluminum Solder. L. B. Allen Co., Inc., 6767 Bryn Mawr Ave., Chicago, Ill.

Samples of Casco Glue. The Casein Mfg. Co., 205 E. 42nd St., New York City.

Samples of Flux Core Solder. Kester Solder Co., 4259 Wrightwood Ave., Chicago, Ill.

Samples of Valve Grinding Compound and Gasket Goo. Pep Manufacturing Co., 33 West 42nd, New York City.

Samples of Metallic X-1. Mends any material. Lux-Visel, Inc., Dept. 0-5771, Elkhart, Ind.

Samples of Dry and Liquid Glue. Keystone Glue Company, Williamsport, Pa.

Problems and Projects

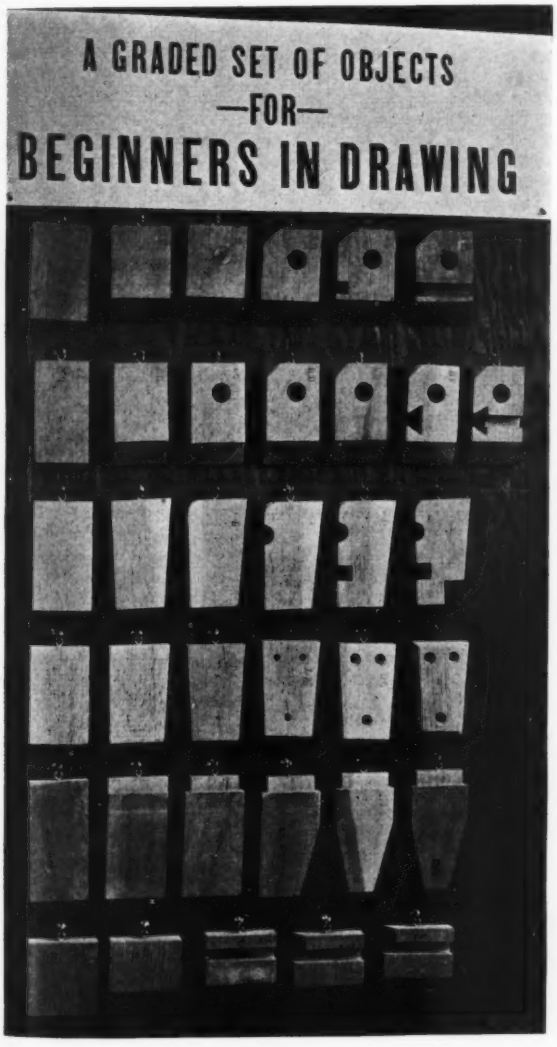
A GRADED SET OF OBJECTS FOR BEGINNERS IN DRAWING

Laurence Parker, Director, Kansas State Board for Vocational Education, Pittsburg, Kansas

Two classes of individuals attempt to learn to make orthographic drawings. There is the great group of boys, and sometimes some girls, who are in junior and senior high school. There are also the mechanics and apprentices from the trades who feel that they should know how to make what they call "working drawings."

Our observation causes us to believe that the first group, the high-school students, is largely taught to draw by the use of pictures of objects as shown in textbooks. The student looks at the picture and then tries to imagine what the object must look like when gazed upon from the top, from the front, and from the end. This method, it is claimed, strengthens the imagination of the learner.

A close watch of a group of such beginners shows that not all of them do, from the first, have the required amount of imagination. Some seem to develop imagination very slowly.



They require considerable time of the instructor in order to get started. Such cases may be wasting the learner's time as well as the instructor's time.

One instructor pointed a remedy to all this waste when he told us, "When a boy is just too dumb to see the object in the picture, I go into the shop and cut the object out of wood. Then, he gets started right away." We were surprised to find that he had quite a collection of such models. So, we wondered why it wouldn't save time for learner and instructor if all learners started out to draw from models, and then later on draw from pictures in the texts.

Some of the same teachers who teach drawing in high school have been drafted as evening-school instructors of mechanics. Not always did the class members seem interested in drawing from pictures of objects in books. If interest lagged, they dropped out. If progress was slow in their drawing due to lack of imagination, they became discouraged and missed in attendance or dropped out.

A study of the needs of mechanics showed that their use of drawing in their work consisted in making sketches or drawings of parts used in the trade. It seemed, therefore, that practice from the first in drawing from objects was what they needed. Since their time for instruction and practice was limited, a quick, easy method seemed absolutely necessary. Some instructors following out this suggestion made a collection of parts from the trades of learners and made some improvement over the old method of instruction.

There was still something lacking. An inspection of the objects collected showed that the learner needed to start by means of more simple objects than some collections contained. It was then suggested that a carefully graded series of objects be used as a preliminary to the use of objects from the trade.

The problem was put up to E. G. Barber of Salina, Kansas, who has had long experience in teaching both high-school students and mechanics. This resulted in the planning of a set of 36 blocks which are shown in the accompanying illustration. It is believed that these blocks comprise a carefully graded set covering the essential difficulties of drawing.

It is suggested that the blocks be mounted on a 3-ply panel similar to the one shown in the illustration. The student should be allowed to proceed across the first row as far as he likes. If he feels that the blocks are becoming too difficult, he can start the second row, the third row, etc. Their use has been tried out in a limited way with very good success.

The blocks should be drawn by quick, more or less free-hand sketches to approximate scale in order that the greatest possible amount of practice in solving the problems of orthographic projection may be secured in a minimum time. Practice in drawing at half scale, twice size, etc., can be carried on with their use.

After this practice is secured, the blocks can be placed in such position for drawing purpose that they naturally lead to the method of drawing from the pictures in texts. It is believed that the set will care for a class of 15 beginners. This is due to the fact that the first block in each series is a beginner's block. For larger classes, the instructor may add other blocks of his own design which may be similar but not exactly like blocks in the set.

After drawings have been made by the group of beginners, a check-back upon their knowledge can be made. Students can be required to identify the blocks which the drawings describe. The blocks and drawings thus could be used as the beginnings of a blue-print-reading course.

One teacher of drawing believes the blocks will have considerable value in teaching boys to measure objects and as practice in the use of fractions.

The use of these objects is intended only to supplement the work of instructor and text, and thereby to save the time of the learner.

A set of these blocks may be seen by the visitors at the A.V.A. Convention in Pittsburgh, Pa., December 5 to 8.

BRAD BOX

C. F. Zaenglein, Circleville, Ohio

It always is troublesome to keep brads and wire nails from being wasted by boys who throw them into the wrong boxes. The box shown herewith has solved this problem. It is circular, has six compartments, and a lid which opens on but one compartment at a time. The lid cannot be removed, but can be revolved so as to bring the opening opposite to any one of the compartments.

This feature is quite an advantage, because then the boys are not so likely to throw the brads or nails which are left over into the wrong compartment.

The box may be made of hard wood, using 20-gauge galvanized iron for the lid and sides.

The wooden spool or cylinder used for the center should have narrow saw slots sawed lengthwise, as shown in the illustration, about ¼ in. deep to receive the edges of the sheet-metal partitions. The other edges of the partitions should be soldered to the sides of the brad box.

The two wooden parts are fastened together with two flat-head screws.

The sheet-metal sides, which consist of one metal strip, should be nailed to the wooden bottom with 3d lath nails. Next, cut out the lid, and solder a ½-in. strip of sheet metal around the edge to act as a flange, as shown.

The handle, which is a small sash handle, serves two purposes: first, to turn the top to any desired position, and second, for carrying the brad box. The handle is riveted to the top.

The top is then fastened to the box by means of a washer and a r.h. blued screw.

THE PRINTING TEACHER AND THE GRAPHIC-ARTS CODE

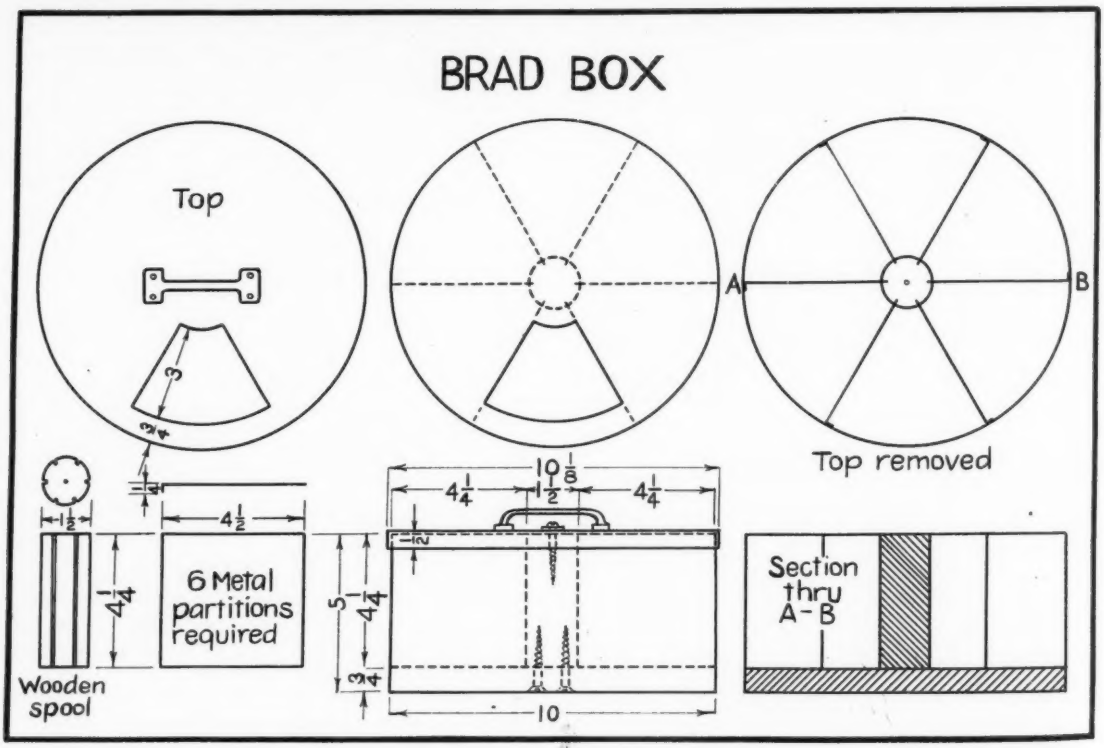
W. B. Morgan, Nokomis Junior High School, Minneapolis, Minnesota

The question has arisen whether or not the code of fair competition for the graphic-arts industries affects the printing departments in schools. After a careful reading of the code, Mr. Allen E. McGowan, Code Administrator for Divisions A-2 and A-5, was interviewed; the results of this interview are presented here with the hope it will clarify this matter for the printing teachers.

The code is the most detailed and complicated which has thus far been presented to the National Recovery Administration. In its present form, the code will cover nearly fifty separate and subdivisional industries which presented their own codes of fair competition.

This code was approved and signed by President Roosevelt on February 17, 1934.

There are several items in the code that affect departments in



schools other than the printshops. Each printing instructor should show this article to his principal or school director.

Since the code was drawn up to improve the conditions in the printing craft, and to put the graphic-arts industry on the same plane as other industries now operating under the N.I.R.A., we, as instructors in the craft, should co-operate to the fullest extent. It should be of particular interest to us to improve the industry that we are preparing boys to enter.

Then, too, many printing teachers are called upon to do production work, and much of this for those outside the school in which they teach. This code will help these teachers to eliminate this outside work, and will leave them more time to train their boys along lines approved by good courses of study. All one needs to say now is, "To do that job for you would be a violation of the graphic-arts code, unless I did all of the work myself, and charged you prices as set up by the local board in charge of price schedules for printers."

A copy of the complete code can be secured from your divisional code manager, or from your state editorial or press association, or from the superintendent of documents at Washington, D. C. The cost is five cents.

The Interview

Question: Does the graphic-arts code affect the printing departments in our public schools?

Mr. McGowan: Yes, Section 26, paragraph G, says (Special Competition) that any printing produced by tax-supported institutions must be priced at economic hour rates and cost schedules set up by code authorities.

Question: May the school printshop print tickets, handbills, etc., to be used by the school for school functions, entertainments, etc.?

Mr. McGowan: Yes, it is not the purpose of the code to interfere with the school printing as long as the printing is to be used for school purposes.

Question: May the school printshop print tickets, letters, advertising, etc., for its own parent-teacher organization?

Mr. McGowan: Yes, the P.-T.A. is really the parent-group of the school. Its objectives are closely aligned with the objectives of the school.

Question: Will a school printshop be allowed to print its own school paper, magazine, or booklet?

Mr. McGowan: The Code does not interfere with the right of schools to publish its own newspapers and periodicals, provided they are not published in competition with commercial shops, and rates for advertising are based on cost of production.

Question: School printshop A printed two thousand Christmas greeting cards, then sold them to the teachers and the others. Will this practice be a violation of the code?

Mr. McGowan: Yes, this would place the school shop in competition with commercial shops and stores selling greeting cards. This applies to all forms of printed matter, not only greeting cards, unless the prices charged are those set up in cost-determination schedules.

Question: If a person brings his own paper and ink to the school printshop may the shops print the job for him?

Mr. McGowan: No. That person should take his job to a commercial shop. The school printshop is not a production plant, and, since it is supported by public tax money, cannot enter into competition with commercial shops. If the school shop produces printing for others, it comes under the code provisions and the child-labor provisions would apply.

Question: Is it permissible for a school to do mimeograph work for a person, firm, or organization, such mimeographed material not to be used by the school?

Mr. McGowan: No. The code covers all forms of "printing," and is defined to mean "The act or process of printing, impressing, stamping, or transferring upon paper or paperlike substances, any ink, color, pigment, mark, character, or delineation, including any and all partial processes and services used in printing."

Question: May a school printshop print something for a person or firm and not charge them for materials or labor?

Mr. McGowan: Section 27 states, "No establishment shall secretly or otherwise give or offer to give any rebate, allowance, premium, 'free goods,' refund, commission, term of credit, unearned discount, special service or other valuable consideration which is discriminating between customers."

Question: When may a school printshop produce printed matter to be sold or given away, such printed matter not to be used by said school?

Mr. McGowan: Any school printshop may produce printed materials and sell the same. But the hours of work, working conditions, wage and price schedules, etc., of the code must be observed and obeyed. Don't overlook the fact that there is a child-labor clause in the code. This item will be watched carefully by the code authorities. The gains made in 1933 and 1934 in eliminating child labor from industry are not to be endangered.

Question: What are the penalties for violating the graphic-arts code?

Mr. McGowan: Section 9, paragraph A, states: "The penalties for the violation of any provision of this code shall be provided in the N.I.R.A., and the cost of any investigation may be assessed against any establishment found guilty of a violation."

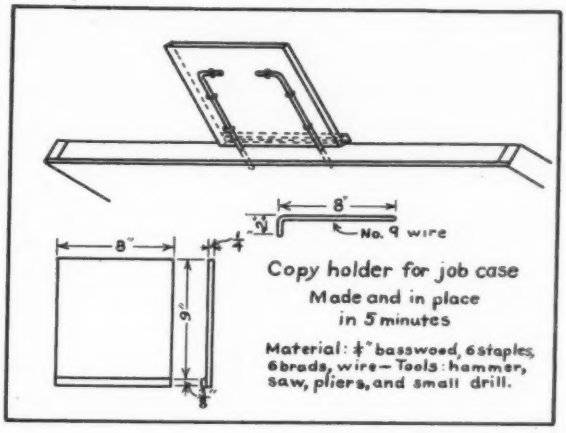
Question: Does this code affect mimeograph, stamping, or printed work in any department of the school other than the printshop?

Mr. McGowan: The code affects the school regardless of where the printing equipment or materials is located. Superintendent's office, clerk's office, commercial department, printshop, all come under the same ruling.

COPY HOLDER FOR JOB CASE

W. Harry Phipps, Chancellor Avenue Junior High School, Irvington, New Jersey

Some scrap pieces of basswood, a few pieces of No. 9 wire, some small brads and staples, and a few minutes of time suffice to stop the inconvenience of having one's copy always sliding down over the job case.


8"
No. 9 wire
8"
9"
Copy holder for job case
Made and in place in 5 minutes
Material: ¼" basswood, 6 staples, 6 brads, wire — Tools: hammer, saw, pliers, and small drill.

After the holder shown in the illustration is made, one can measure on the back rail of the job case where the wire rods of the holder should come. Then drill holes the size of the wire, at a 45-deg. angle toward the bottom. This done, and the copy holder is ready for use.

INDUCTION COIL

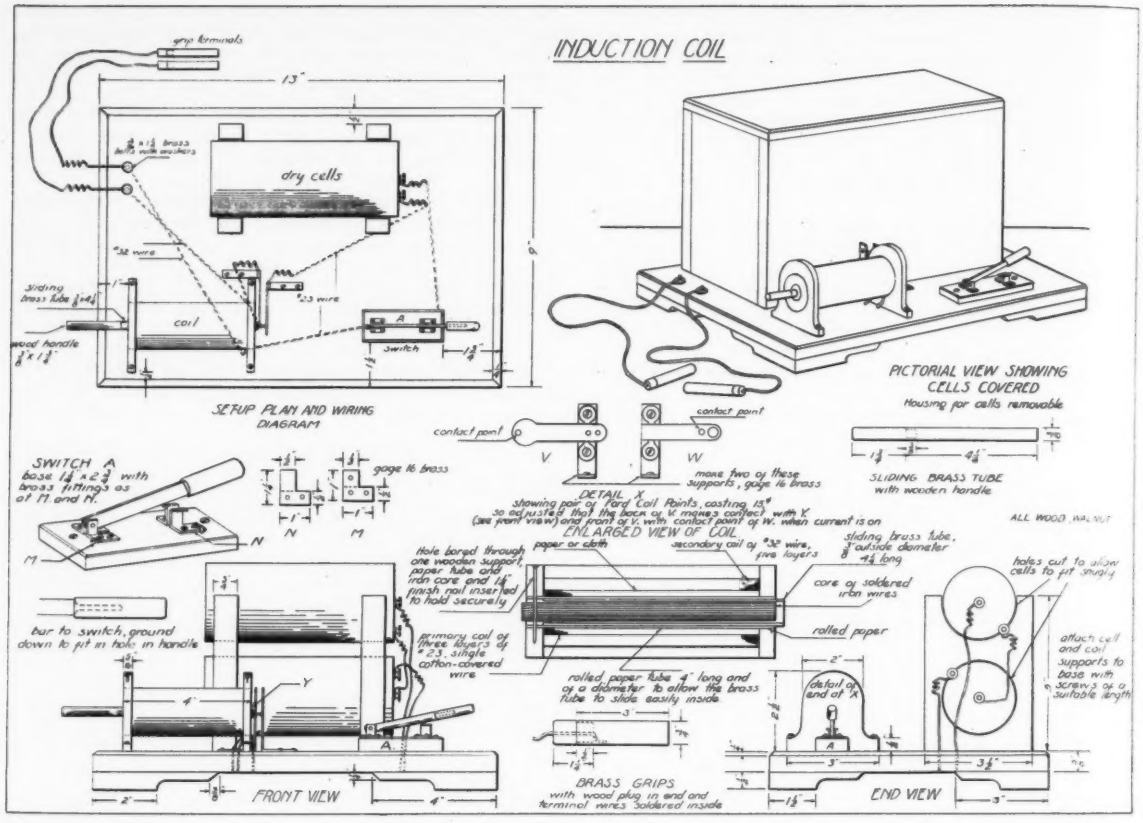
Leon H. Baxter, Western Reserve Academy, Hudson, Ohio

Correlating the work of the science department with that of the shop has been one of the interesting features of handwork at Western Reserve Academy. The induction coil offers a problem that is very practical and worth while for just this type of correlation. Work of this kind brings the science department in closer touch with the shop by demonstrating in practice what is taught in theory.

It combines woodworking, metal working, and electricity in a very interesting way and develops considerable initiative on the part of the boy who takes up the challenge.

The induction coil is simple and inexpensive in construction and develops an "electrical kick" which boys feel and realize.

The finished product compares very favorably with the expensive commercial article, and a great deal of fun and


INDUCTION COIL
grip terminals
13"
dry cells
coil
switch
sliding brass tube
wood handle
SETUP PLAN AND WIRING DIAGRAM
PICTORIAL VIEW SHOWING CELLS COVERED
Housing for cells removable
SWITCH A
contact point
DETAIL X
showing pair of Ford Coil Points, costing 15¢
SLIDING BRASS TUBE with wooden handle
ALL WOOD WALNUT
ENLARGED VIEW OF COIL
paper or cloth
secondary coil of #32 wire, five layers
core of soldered iron wires
rolled paper
primary coil of three layers of #23, single cotton-covered wire
rolled paper tube 4" long and of a diameter to allow the brass tube to slide easily inside
BRASS GRIPS with wood plug in end and terminal wires soldered inside
FRONT VIEW
END VIEW

pride is experienced by its maker in trying it out on his interested friends.

The construction of the coil is as follows:

The base is first made of a suitable wood, such as walnut. Then the corner supports, eight in all, are cut out of ½ by ½ by 4-in. material. Miter the corners at 45° and glue and nail to the base with 1-in. No. 17 brads.

The two supports for the dry cells are next made ¾ by 3½ by 5 in. The holes and the semicircular cuts are made of a size to allow the cells to fit snugly within. Then the two smaller supports for the coil are made.

The switch may be bought, but it is more interesting to make one. The wood base is ¾ by 1¼ by 2¾ in. The handle may be a piece of ¾-in. wood dowel. The contacts are made of 16-gauge brass, as shown at N and M in the illustration. The switch is assembled by riveting the handle to the forward contacts, and the switch base attached to the main baseboard with two 1¼-in. No. 8 r.h. screws.

The wire running to the grip terminals is No. 18 bell wire. The grips are made from pieces of ¾-in. brass tube, cut 3 in. long with wooden plugs 1¼ in. long set in the ends. The wires should run through these wooden plugs and be soldered to the inside of the handles.

The coil itself is made in the following manner:

Cut a piece of ⅜-in. brass tube 4¼ in. long. This tube has a wooden handle 2⅛ in. long, fitted into the end of the tube for a distance of ⅜ in.

A rolled paper or cardboard tube is made 4 in. long and of an inside diameter which will allow the brass tube to slide easily within.

A core of soft-iron wires is made and soldered together, and enough wire, cut 4¼ in. long, is used to fit inside the sliding tube and yet allow the tube to be pulled easily back and forth. This core is held in place by driving a 1¼-in. finish nail through the wooden support and core itself, as is indicated in the enlarged view of the coil. The intensity of the current is controlled by sliding the brass tube in or out.

The rolled paper or cardboard tube is next wound with three layers of No. 23 single cotton-covered wire. This constitutes the primary coil. A couple of turns of ordinary wrapping paper are wound about this, and a thorough coating of shellac applied. Over this the secondary coil is wound, consisting of five layers of No. 32 wire. This is also covered with two or three rolls of paper and shellac coated.

The terminals of the primary and secondary coils are connected to their respective binding posts, as is shown in the wiring diagram.

Detail X shows a set of old Ford coil points which can be bought at any salvage dealer for fifteen cents. These are located and adjusted as shown.

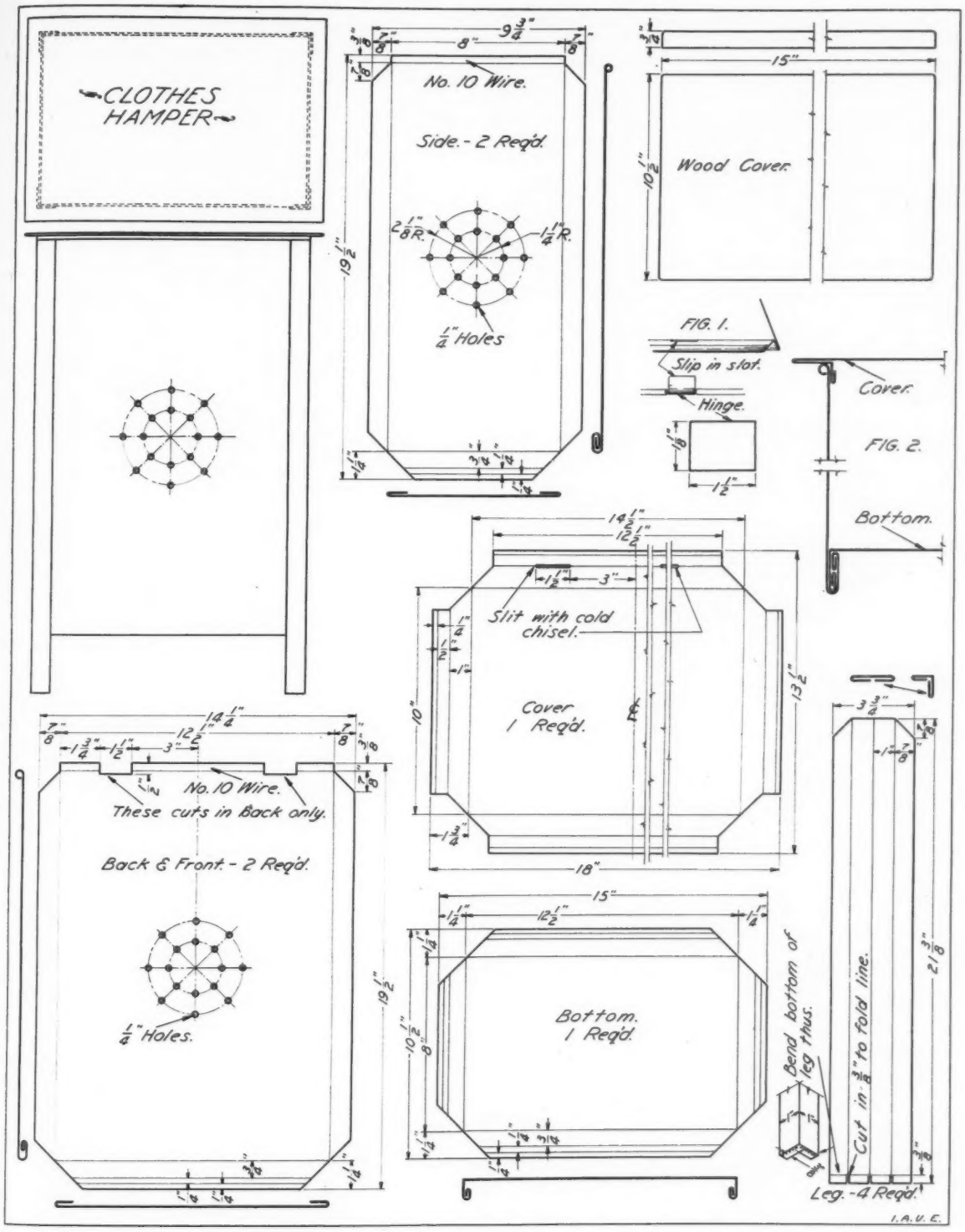
This instrument can be made as simple or as ornate as is desired, and a well-finished set is a very interesting, instructive, and amusing project to construct and use.

CLOTHES HAMPER

Harry W. Kroll, School District No. 5, Buhl, Minnesota

General Directions:

1. Go over the drawing and model carefully to understand the construction of your project.
2. Read your job sheet to note whether any new operations are involved in this project.
3. When demonstrations are given, ask questions if in doubt about any part of the construction of the project.
4. Make a trial sample of a joint or construction which is new, in order that it may be more clearly understood when worked out on the project.
5. Go over the drawing and note the number of pieces required and the dimensions of each piece.



6. A cover made of wood may be preferred. The one shown on the drawing will substitute for the metal one, if desired.

7. Cut out all the material for the project after completing step No. 5.

Material:

No. 28 galvanized or black iron. No. 10 wire.

Body:

1. Having cut out the opening for the hinges in the back piece, and the corners as shown, fold the edges of the sides, front, and back with a closed lock for 7/8 in., as shown.

2. Fold in detail the bottom edges of these pieces for the allowance of 1¼ in., as shown in the drawing.

3. Turn a wire opening to fit a No. 10 wire on the top

edges of these pieces and complete wiring around a false wire. Withdraw the false wire when wiring has been completed.

Legs:

1. Complete the two folds for the four legs, as shown in the drawing. Allow sufficient space between the folds for slipping the legs on the corners of the body.

Bottom:

1. Fold in detail all edges of the bottom, as shown. In making the first double-hem folds, use less than the ¼-in. allowance in the first fold.

Cover:

1. Try a sample piece of scrap in order to be certain of the folding for this piece.
2. In Figure 2, a section of the cover is shown with the kind of fold used.
3. Solder the mitered corners carefully.

Wire:

1. Cut the wire to required length and fold into wire groove around top.

Assembly:

1. Slip the wires into the top edges of the body.
2. Form the hinge pieces around the wire openings on the back as shown in Figure 1.
3. Now slide the four legs in place and adjust to fit accurately.
4. Put the bottom in place and tighten joint securely.
5. If the metal cover is used, slip the hinge pieces through the slits in cover and bend over and solder in place. Adjust the cover to fit accurately. If a wooden cover is used, punch holes in the hinge pieces and fasten cover with screws.
6. File all sharp corners and clean entire piece thoroughly with steel wool.

Finish:

1. Be certain all dirt is removed from project.
2. Enamel in a suitable color and decorate with a spray to harmonize with the base coat.

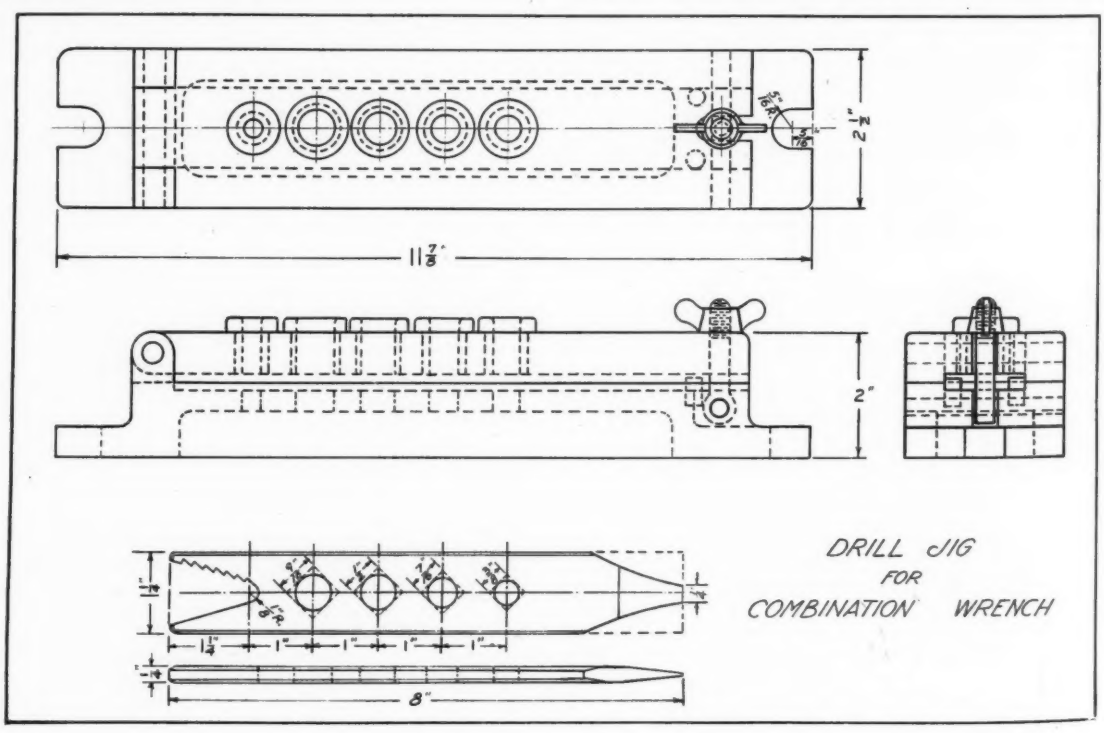
JIGS AND FIXTURES

G. H. Snaddon, Central High School, Detroit, Michigan

A Related-Materials Lesson

Jigs and fixtures are devices used in the quantity production of duplicate machine parts. The use of jigs and fixtures makes it possible to perform many diverse operations quickly and accurately, and as a result they are used extensively in all modern manufacturing establishments. They have reached their present state of development and use as a result of the constant demand for precision, standardization, and economy in manufacturing methods during recent years. Scarcity of skilled workmen led to their original invention. "Whitney was so hard put to it for skilled workmen that he had to invent machines that would serve as human arms and fingers. One of his most important devices, found in every machine shop, rejoices in the frivolous name of the 'jig.' Suppose a plate is to be drilled with ten holes which must register exactly with ten holes in another part. It would be a tedious matter to measure them off and lay out their positions with any great degree of precision. Only an experienced mechanic could be trusted to do the work, and Whitney had all too few such mechanics. If ten thousand such pieces were to be drilled, the work would take an eternity; and even if the same man laid out the positions of the holes in each case, there would be certain slight variations in the different pieces, because it is impossible for a man to avoid slight errors.

"A jig makes errors impossible. A box is made into which the plates are fitted. Over the box is a lid or frame in which holes are drilled by a skilled workman at exactly the required spacing. After that, no further skill is required. One after the other the plates are fitted into the box and drilled through the holes in the lid without stopping for measurement, and in all the pieces the holes must be spaced exactly alike. It was in this way that Whitney obtained machine-like precision, even though he had to do largely without machines and had scarcely any trained mechanics. Whether he invented the jig or not is a disputed question, but he was certainly one of the earliest users of it. Today we cannot get along without the jig. It is a holder for the piece of work and at the same time a guide for the tools that are



to be used on it. It helps us properly to set up a piece of work in a machine."[1]

Difference Between Jigs and Fixtures. It is difficult to define clearly between a jig and a fixture. Many special tools in use today are a combination of both. As a general rule, jigs are designed to guide cutting tools in drilling, boring, and other like operations, and may be designated as drill jigs, boring jigs, etc., according to the operations for which they are used. Fixtures are ordinarily devices made to support and hold work in place while it is being machined and may be used in milling, broaching, profiling, and other machining processes. A milling machine, shaper, or drill-press vise is an example of a common type of standard fixture in daily use.

Purpose of Jigs and Fixtures. Jigs, fixtures, and other tools and equipment are used chiefly to cut the costs of production. This cost reduction is obtained in several ways, some of which are: machine parts can be produced much more rapidly; greater accuracy is secured, making it possible to assemble the parts on moving, progressive assembly lines without any fitting; interchangeability is obtained, thus saving time in assembling in addition to replacing broken and worn-out parts quickly; equally good results can be obtained with the use of jigs and fixtures by unskilled labor; jigs are adopted for use in multiple-spindle drilling machines so that numbers of holes can be drilled at one setting; parts can be finished simultaneously in different departments and brought together immediately and assembled into finished products. The aforementioned time-saving and cost-reducing methods were not practiced in the past system of individual manufacturing, in which each separate part had to be made in the order in which it went on the finished machine, then fitted in place, thus making it necessary to wait for the completion of one part before machining the next.

Types of Jigs. Jigs are made in an endless variety of shapes, sizes, and forms. The template jig is perhaps the simplest form in use today. It is oftentimes nothing more than a thin plate of steel or sheet metal cut to the desired shape and used to mark around. Template jigs of this type are used in cases where extreme accuracy is not essential and when only a few parts are needed. Other common but more complicated types of jigs and fixtures in use are the open and closed jigs, trunnion jigs, boring and reaming jigs, riveting jigs, locating and assembling jigs, lathe fixtures, indexing fixtures, planing fixtures, continuous milling fixtures, rotary milling fixtures, universal bending fixtures, and so forth.

Elements of Jig Design. In general, the most important parts of a jig are:

1. The guiding features — bushings for drills, guides for cutters, setting pieces or templates, and the like.
2. The clamping devices.
3. The locating points against which the work is clamped to bring each individual piece into the correct position in the jig.

The guides usually take the form of concentric steel bushings into which the drill or drills fit closely, thereby guiding them into the proper location. Guide bushings may be either stationary or removable. Removable bushings are frequently used for work which must be drilled and reamed, when different parts of the same hole are to be drilled to different diameters, or when the hole is to be counterbored or faced. Drill bushings are generally machined to shape from tool steel, hardened, then ground both externally and internally. In addition, the hole is usually lapped to finished size. These bushings are also usually made to standard dimensions.

Clamping devices are necessary to hold the work rigidly in the jig against the locating points while it is being machined. To prevent getting lost, clamping devices are ordinarily an integral part of the jig body. The simplest form of clamping device is the strap clamp, many shapes, sizes, and variations of which are commonly used to meet varying conditions. A strap clamp that will give satisfactory service can be easily made from a rectangular piece of steel by shaping an oblong hole in it large enough to fit a bolt, thus allowing the strap to be pulled back far enough to clear the work and thereby provide for removing and inserting the work easily and rapidly from the jig. The bolt, screws, and the like, used for clamping are ordinarily those of standard dimensions. Thumbscrews and wing nuts are frequently used on a jig when it is not necessary to tighten the work very firmly. When greater clamping pressure is needed to hold the work in place, hexagon or square-headed setscrews or bolts are generally used, thus providing for the use of a wrench. Other screw-tightening and jig-clamping devices in use are star handwheels, hand knobs, wrench handles, hook bolts, hinged bolts, swinging leaves, spring latches, eccentric clamps, cams, and many other rapid-releasing and quick-acting time-saving mechanisms.

Locating points in a jig usually consist of finished pads, bosses, seats, lugs, etc., cast solid with the jig. The work is clamped against these finished surfaces thereby bringing it into correct relation to the cutting tools, and thus providing for uniformity of the product. Other commonly used methods of locating the work, depending upon its nature and shape, are by the use of dowel pins, locating screws, adjustable V blocks, adjustable screw bushings, sliding bushings, studs, and many others.

Materials for Jigs. Jig and fixture bodies are ordinarily made from cast iron and steel. For small and medium-sized work, such as parts for typewriters, adding machines, sewing machines, cash registers, and similar machines, the steel jig offers decided advantages, while for larger work, such as automobile, airplane, machine-tool fixtures, and the like, the cast-iron jig is perhaps cheaper and more suitable.

Cost of Jigs and Fixtures. One of the most important questions to be decided before making a jig or fixture for any particular piece of work, is the cost involved. It would be uneconomical to make an expensive jig or fixture for parts that would be duplicated only a few times. On the other hand, an inexpensive jig may be inadequate for parts that have to be duplicated in large quantities rapidly and accurately. To decide which type, if any should be designed and used in each case, depends entirely upon the existing circumstances. As a general rule, jigs and fixtures are expected to pay for themselves in the number of parts they produce, the time saved by their use and through other economic factors, some of which have already been mentioned in the discussion of the purpose of jigs and fixtures.

Jigs and fixtures are usually designed by tool-designing engineers, made by toolmakers to precision limits in a toolroom, and used in various production departments by semi-skilled and unskilled workers.

Illustration. The illustration shows a cast-iron box-type jig that may be made in the school shop. It can be used for drilling steel pieces which may afterward be shaped into useful combination wrenches as shown. The drawing of the jig is practically self-explanatory. Each piece is located in the lower part of the jig, then the upper part is lowered and clamped into place with the wing nut. The holes may be drilled separately, or all at once, setting on a multiple-spindle drill press.

Questions

1. What is a jig? What is a fixture? Give a common example of each in use in your school shop.
2. Why are jigs and fixtures used in manufacturing?
3. Give five factors in favor of the use of jigs and fixtures.
4. What is a template jig, and when is it used?
5. What are the important parts of a jig?
6. What are jig bushings? Why are they necessary?
7. Discuss the use of clamping devices.
8. What is a strap clamp? Illustrate its use.
9. Why are locating points necessary in jig construction?

[1] *A Popular History of American Invention*, Vol. II, page 326.

10. What materials are best suited to jig manufacture?
11. When is it advisable to make and use jigs and fixtures?
12. Explain clearly the following terms: standardization; precision; boring; concentric; counterbored; faced; lapped; standard dimensions; reamed; hardened; ground broaching; profiling.

References

Machinery's Encyclopedia.

Jigs and Fixtures, Colvin and Haas, McGraw-Hill Book Co.

Tool Engineering, Dowd and Curtis, McGraw-Hill Book Company.

A Popular History of American Invention, Vols. I and II, edited by Waldemar Kaempffert.

A SMALL PORTABLE AMPLIFIER FOR GENERAL SCHOOL USE

Francis J. Coyte, Connelley Trade School, Pittsburgh, Pennsylvania

The World's Fair at Chicago would not have been a success if it had not been for the many and varied uses of sound effects and services in one form or another. Some of these sound effects made possible the dissemination of the restful orchestration music throughout the fairgrounds; produced the deceptive roar of wild animals at the side shows; emphasized the announcements of lost children; and gave weight and volume to the persistent box-office barker on the midway.

The public has become *sound-minded* since the advent of the radio and talking pictures, hence the local undertaker must provide portable sound apparatus at well-appointed funeral services, and the hard-of-hearing churchgoers refuse to sit in the front-row seats, demanding, instead, that hearing aids be installed in the traditional family pews.

Public school buildings only recently have received the serious attention of sound engineers in overcoming the distracting noises produced by conversation and the clatter of feet in the corridors, and in the correction of poor acoustics in auditoriums, gymnasiums, and cafeterias.

Relatively few school buildings throughout the country, however, are equipped with a complete sound system. It is with a feeling of service and helpfulness, therefore, that the writer offers a complete list of materials and constructional details for a portable amplifier that has been built by his students. This amplifier is for general school use, and is capable of re-enforcing any speaker's voice within reasonable range, when the audience does not exceed 500 persons.

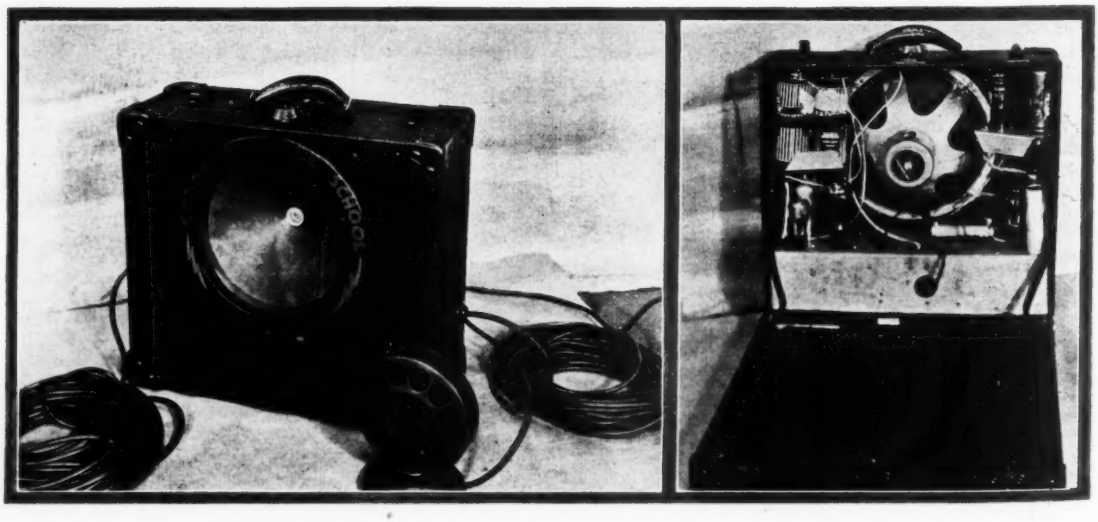
Radio and victrola-record programs also can be transmitted over this amplifier, and a separate additional speaker may be connected to the amplifier if increased coverage is desired (see circuit drawings).

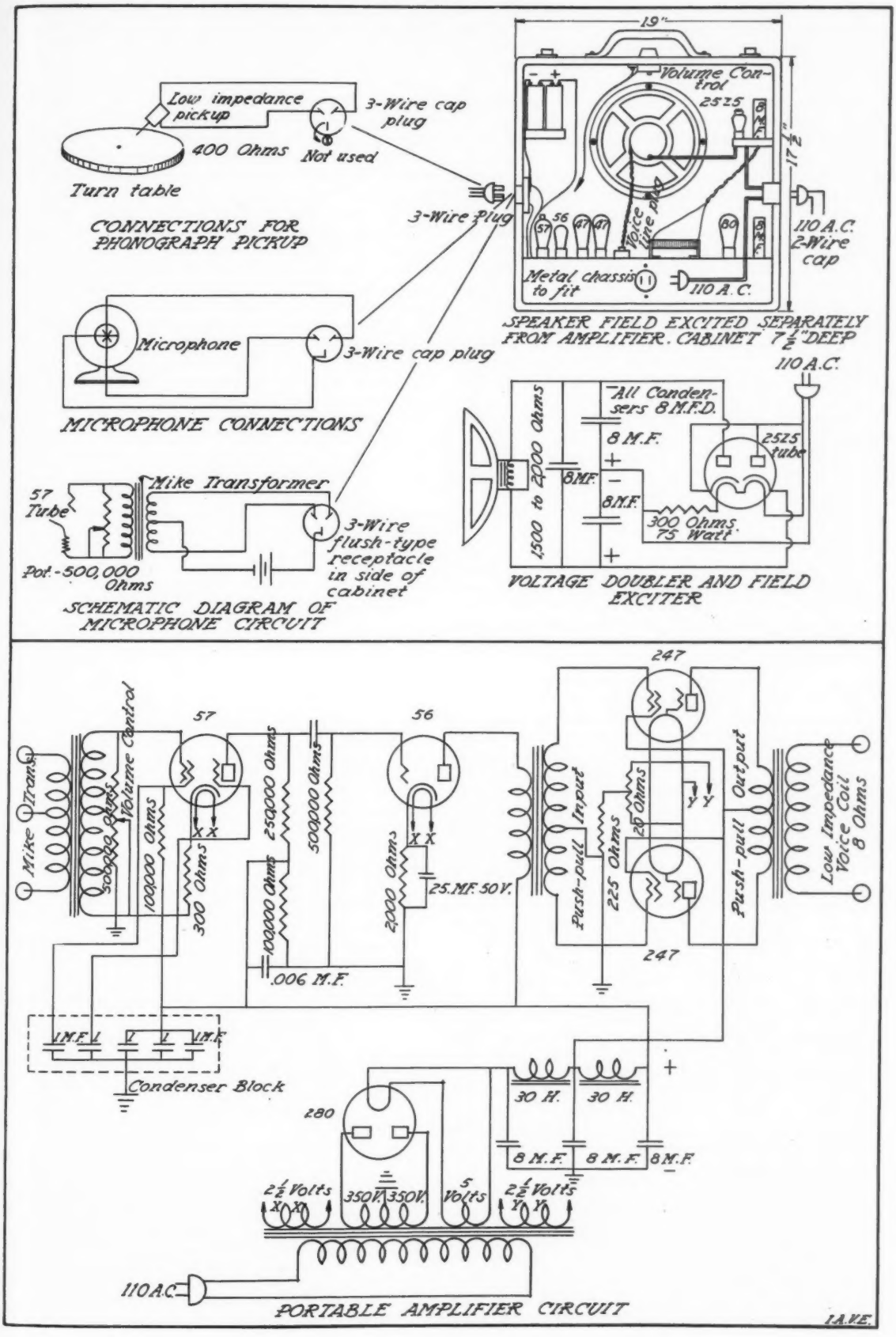
The portable features of this amplifier make it a very desirable piece of equipment. In the English classroom, it may be used for practice sessions, then taken to the gymnasium, cafeteria, or auditorium for the regular program, after which it may be returned to the principal's office for safe-keeping.

The basketball coach also can use the amplifier to direct practice sessions in the gymnasium. This is especially necessary where the walls and ceilings have been covered with cork.

The amplifier can be built with new materials for about $50, with a choice of double-button microphones ranging in price from $10 to $25 in addition. It may also be built up, as was done in the case of the one shown in Figure 1, from radio parts which were rearranged and assembled into a 4 by 18½-in. sheet-metal chassis. The latter was then placed into a secondhand 7 by 17 by 19-in. wood-frame carrying case. The dynamic speaker was chosen because of its light weight, minimum over-all depth, and large cone. The microphone shown is a high-grade double-button type, although satisfactory results may be obtained by using any one of several lower-priced makes. A 50-ft. 2-wire rubber-covered extension cord and a 3-wire rubber-covered shielded microphone cable should be provided with the amplifier to secure the necessary flexibility of connections, and to obtain the correct location and best response from the units. A microphone floor stand can be built to support the microphone unit, instead of the table model shown in Figure 1. The accompanying list of new parts and prices includes a floor stand, a carrying case, and a good double-button microphone. All are listed at prevailing catalog prices. It is assumed that new materials will be preferred in some cases, while others may choose to revamp radio parts now in their possession. The list of new materials and selection of parts used in this amplifier will be described.

Before starting on the constructional details, it may be well for the prospective builder to secure the following: *Radio Craft Magazine* (October, 1933): "How to Make Four New Amplifiers," by F. Lester (page 214); "Converting D C Dynamics for A C" (page 227), Gernsback Publications, Inc., 96–98 Park Place, New York City; *Acratone Sound Equipment Catalogue, 1933,* Acratest Products Company, 20 Murray St., New York City. Many mail-order houses list their equipment using a circuit code, such as: Class A; Class B; Class A prime, they also rate their respective output abilities in watts, all of which is somewhat confusing. This apparent confusion can be unraveled and understood by referring to the magazine article and the catalog. In all calculations in-




Low impedance pickup
3-Wire cap plug
400 Ohms
Not used
Turn table
CONNECTIONS FOR PHONOGRAPH PICKUP
3-Wire plug
19"
Volume Control
2525
17½"
110 A.C. 2-Wire cap
Metal chassis to fit
110 A.C.
SPEAKER FIELD EXCITED SEPARATELY FROM AMPLIFIER. CABINET 7½" DEEP
Microphone
3-Wire cap plug
MICROPHONE CONNECTIONS
110 A.C.
All Condensers 8 M.F.D.
8 M.F.
2525 tube
1500 to 2000 Ohms
8 M.F.
300 Ohms 75 Watt
VOLTAGE DOUBLER AND FIELD EXCITER
Mike Transformer
57 Tube
3-Wire flush-type receptacle in side of cabinet
Pot.-500,000 Ohms
SCHEMATIC DIAGRAM OF MICROPHONE CIRCUIT
247
57
56
Mike Trans.
Volume Control
500000 Ohms
100000 Ohms
300 Ohms
250000 Ohms
500000 Ohms
100000 Ohms
2000 Ohms
25 M.F. 50 V.
.006 M.F.
Push-pull Input
225 Ohms
28 Ohms
Push-pull Output
Low Impedance Voice Coil 8 Ohms
247
1 M.F.
Condenser Block
280
30 H.
30 H.
8 M.F.
8 M.F.
8 M.F.
2½ Volts
350 V.
350 V.
5 Volts
2½ Volts
110 A.C.
PORTABLE AMPLIFIER CIRCUIT
I.A.V.E.

volving the amount of power necessary for a given operating condition, the following figures may be used as a rough, but satisfactory check, to determine the maximum amount of output power in watts necessary. For school classrooms, clubrooms, and libraries, allow about 0.3 watt. For rooms seating up to 500 people, allow 3 watts. For rooms of 1,500 seating capacity or over, use about 10 watts of output energy. The expressions Class A, Class B, and Class A prime roughly can be defined as: A (grid biasing), B (no grid biasing), and A prime (full wave bridge, biased). The latter is easily recognized by the fact that two tubes are used in each amplifying position, instead of one. The amplifier herein described will draw approximately 150 watts from the power line, and deliver 3 watts, or more, of sound energy to the speakers.

After looking over the different circuits, the writer decided to use two new tubes: a 6-prong 57 tube, and a 5-prong 56 tube, as shown in the circuit drawing, feeding two well-known pentode 47's in push-pull Class A (grid biased). The 57 tube feeds the 56 tube through a resistance condenser coupling, and the 56 tube feeds the 47's through an input push-pull transformer, and the 47's feed the speaker through an output push-pull transformer.

A general inventory of available radio power packs, dynamic speakers, and B eliminators should first be gone over so as to choose the proper combination of parts. This is desirable so that they may be reassembled into a compact metal chassis, and the speaker fitted into the style of cabinet or carrying case chosen. The power transformers, filter condensers, chokes, and voltage divider used, were taken out of Pilot K112 B Eliminator and placed in one end of the sheet-metal chassis. The microphone input transformer, push-pull input, and output transformers occupy the remaining space at the other end. This particular power pack was chosen because it used a 280 rectifier tube, and had an output rating of 90 milliamperes at 300 volts d.c., with intermediate voltage tapes, making it possible to choose either 45's or 47's as amplifiers, and at the same time secure filament and plate voltages for the 57 and 56 tubes. The power transformer listed in the parts list will provide the same voltages, however. A study of the amplifier and power-supply circuits will reveal the simplicity of the entire hook-up. The audio output transformer must match the power tubes chosen, and the output voice-coil winding must match the voice coil of the dynamic speaker (usually about 8 ohms). An output transformer designated for 45 tubes will not work efficiently with 47 tubes, because of the mismatch in plate circuit resistance. The 47 tubes require higher resistance windings than the 45 tubes.

The dynamic speaker used in this amplifier is excited separately and receives its field current from a 25Z5 rectifier tube connected as a voltage doubler, which uses the 110 a.c. instead of a power transformer. The speaker field has a resistance of 3000 ohms, and in order to saturate the magnetic field properly, the voltage was raised high enough (by doubling) to deliver approximately 60 milliamperes of direct current. The 25Z5 full-wave rectifier tube and doubling condensers can be seen mounted separately on a bracket over the amplifier chassis. The 75-watt 300-ohm series filament resistor can be seen mounted on the amplifier chassis so as to dissipate the heat given off by the wires. If a second high-resistance field dynamic speaker is to be used as an extension, it is recommended that a 25Z5 6-prong rectifier tube and doubling condenser be used, thereby eliminating a power transformer. If a radio-set power pack is used for the main amplifier having its own dynamic speaker in combination with it, separate field excitation is not necessary.

The amplifier chassis should be so arranged that the placement of the tubes and tube sockets will not interfere with the frame of the dynamic speaker, thereby permitting removal of the chassis for repairs. It is also advisable to keep the rectifier tubes and electrolytic condensers reasonably spaced so as to permit circulation of air and prevent undue heating. The 110 a.c. plug receptacle and 3-wire microphone receptacle can be seen mounted through the sides of the carrying case, and the volume control mounted through the top near the handle for protection. Shielded rubber-covered hook-up wire is used in the sensitive microphone and input volume-control circuits so as to prevent stray magnetic pick-up from the a.c. filament circuits. Regular cord-attachment caps and 4-prong speaker-attachment plug caps with 3-prong wafer sockets are used in the speaker and supply lines so that the speaker can be removed from the carrying case. Stranded rubber-covered hook-up wire should be used, and heavier wire used in the filament circuits, if possible. The microphone dry cells add considerable weight to the amplifier, and may be replaced with two 4½-volt C batteries connected parallel, although the service hours of the C batteries will not begin to equal the larger cells. The screen-grid 57 tube must also be shielded to obtain the best results from the amplifier and prevent serious hum entering the circuit from this point.

A wooden ring frame fitted in the speaker opening will cover the frayed cloth ends and give the cabinet a finished appearance. The lettering "Connelley Trade School, Pittsburgh," was placed on this ring for identification, because the amplifier was lent for use at the recent Farm Products Show in Harrisburg, Pa., so that the sectional meetings could be conducted more efficiently and effectively.

The case was sprayed with black lacquer, lettered, and then given a coat of clear lacquer, to preserve the lettering and give the finish a lasting gloss.

The extension and microphone cords can be coiled around the speaker hub, and the desk microphone stand can be placed inside the cabinet, making the outfit entirely self-contained, as well as portable.

Parts List for Portable Sound Amplifier

No.	*Name of Part*	*Cost*
1	Carrying case	$ 4.25
2	Single receptacle plugs	.20
1	Microphone receptacle (3-wire)	.65
50	Ft. rubber-covered wire — 2 conductors	1.50
50	Ft. r.-c. shielded micro. wire (3-wire)	3.00
3	Dry cells	.60
1	Electrad 500,000-potentiometer	.60
1	Magnovox dynamic speaker	3.45
1	Tube shield for 57 tube	.20
7	Wafer sockets 4, 5, and 6	.35
1	4-Prong cap for speaker connections	.20
1	Thordarson d.b. micro. trans.	2.94
1	Thordarson push-pull output trans.	2.65
1	Power transformer (100 mills)	1.85
2	30 Henry chokes — acrotest	1.80
1	Condenser block	.70
5	8-Mf. electrolytic condenser (vertical)	2.70
50	Ft. No. 18 r.-c. hook-up wire	.20
25	Ft. shielded wire (hook-up)	.32
2	100,000-ohm 2-watt resistor	.48
1	300-ohm resistor (2-watt)	.24
1	250,000-ohm resistor (2-watt)	.24
1	500,000-ohm resistor (1-watt)	.18
1	2,000-ohm resistor (2-watt)	.24
1	225-ohm resistor (1-watt)	.18
1	Universal microphone floor stand	5.29
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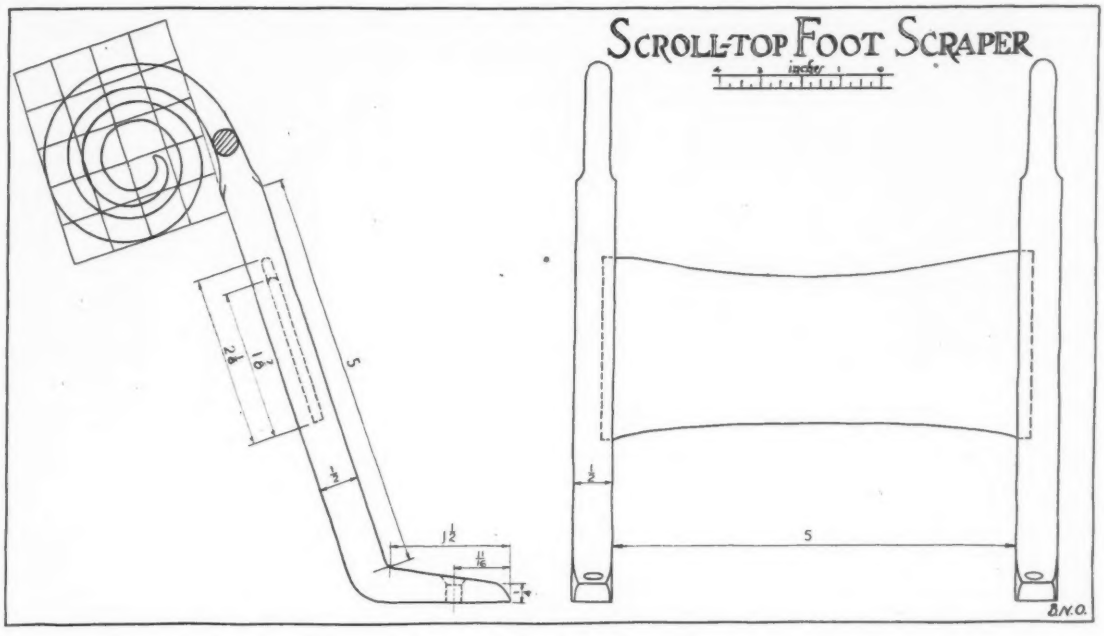
1	Electrad 300-ohm 75-watt resistor	.79
	Solder, machine screws, friction tape, etc.	2.00
1	Microphone plug (3-wire)	.75
1	Thordarson push-pull input transformer	2.65
1	Universal double-button microphone	29.40
	Total	$75.87

PAGES FROM A MUSEUM SKETCHBOOK

Burl N. Osburn, State Teachers College, Millersville, Pennsylvania

Scrolled Foot Scraper

The sides of this foot scraper have been made from square stock, drawn out round and tapered. The scroll is an unusually beautiful one, and is evidently the work of an artist-craftsman. Although, in the original, the scraper ends are run through the sides, construction would be simplified by riveting, if necessary.



DA VINCI'S ROMAN ALPHABET

R. E. McConnell, South High School, Omaha, Nebraska

Lettering is a most interesting study. Ordinarily we make letters freehand, but quite often we need a mechanical letter to meet certain requirements. Drawings which require a mechanical letter are government maps and specifications, structural drawings, railway drawings, and other specialized forms. Such drawings usually use a title page, and it is there that the mechanical letter is needed. By a "mechanical letter" we mean one made with a straightedge and compass.

To meet these conditions, the alphabet which Da Vinci developed from the original Roman is the best, and most easily drawn mechanically. Da Vinci was probably the greatest engineer, scientist, and painter the world has known, and the delineation of this alphabet is only one of his many accomplishments. All modern alphabets can be traced to the Roman, and Da Vinci's form is the inspiration for them. The letters, as we know them, can be traced to an inscription found on the broken Trojan column, dating back to the time of Christ.

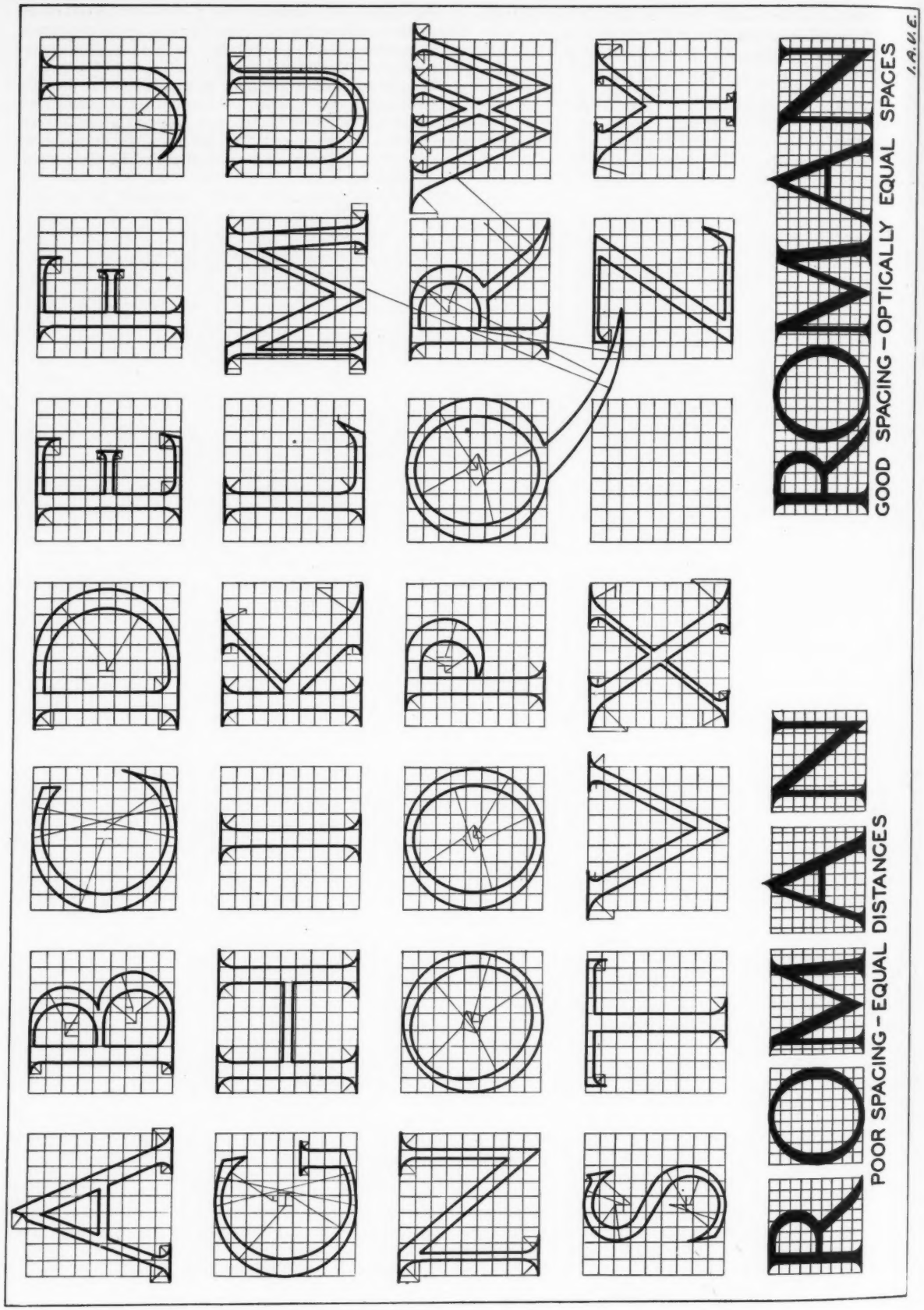
The early history of the development of the Roman alphabet is similar to our experience in developing an alphabet. The Romans borrowed from the ancient Egyptian writings, through the Greeks, and so, by a process of evolution, developed the alphabet as we know it. The evolving was through two agencies; namely, the scriveners and the craftsmen. The monks and scriveners desired a dignified alphabet for their church and historical writings; and the craftsmen desired an alphabet in which the letters cast deep shadows when carved in stone. The craftsmen really influenced the number of letters since they thought U and J could not be carved in stone. Hence the original Roman alphabet contained neither of these letters, and consisted only of capitals. The lower case was developed later.

The original Roman alphabet was written with a reed, sharpened to a chisel point. The thick and thin strokes are a direct result of the manipulation of the reed pen. We should observe that no two thin strokes, nor two thick strokes, join directly. Notice how this is avoided in capital K. The natural way of making a letter is what determines the sequence of thick and thin strokes. For example, in making M, we start at the bottom and make the first stroke up, and it will be thin. This is true because the pen will be turned so as not to catch on the paper when making the upward stroke. The second stroke is down from the top and oblique. It will be a thick stroke. The two remaining strokes are made similarly. Following the natural way of making any letter, we can see how the sequence of thick and thin strokes has come about. Thus, convenience has dictated the order of the thick and thin strokes. This applies not only to a hand-drawn letter, but to the mechanical letter as well.

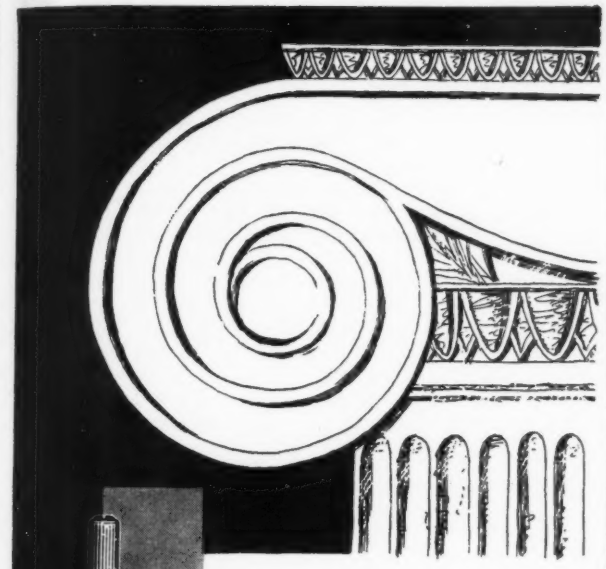
The proportion between the width and height of letters should be carefully observed. Da Vinci has based the letters on a square, nine units on each side. The A is the only letter extending above the nine units. All the other letters are the standard nine units high. The width of letter varies somewhat but all except the M, N, and W can be included within the nine units of width. When combining letters into words it is sometimes necessary to make the letters S and O a little taller than the other letters, in order to have them appear the same height.

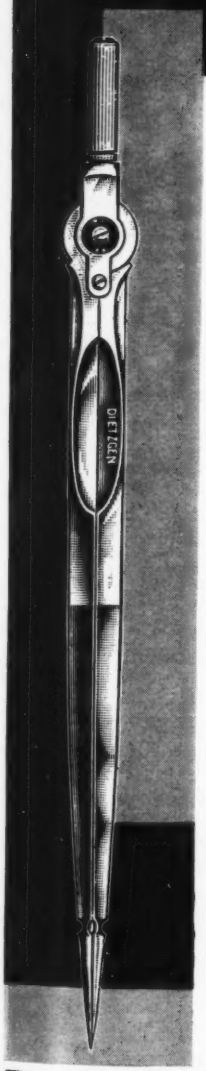
The spacing of letters in words is not a mechanical process. If the spaces between the letters in a word are measured equally, we will have dark and light areas which will give a spotty effect. The letters must be spaced so that the optical effect is rhythmic; that is, the letters flow along in the word and *appear* to be the same distance apart. Letters having a preponderance of vertical lines can be placed closer together than circular letters, and will approach a mechanical spacing; for example, the word HIM. Again, when we have such words as BOY and SPACING, we cannot space

(See alphabet on next page and continue on page 8A)



Roman alphabet attributed to Leonardo Da Vinci. Submitted by R. E. McConnell





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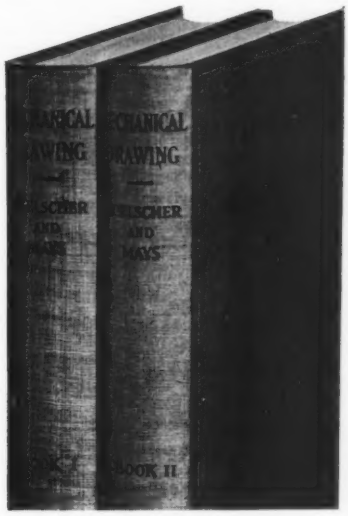

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(Continued from page 393)

the letters regularly because of the irregular spaces between them. These spaces, really areas, should be equalized in order to insure the maximum of legibility. The words themselves must each stand out; therefore, an appreciable space is left between the words. This space between words can be measured and regular.

If you will observe the spacing of the letters in the word ROMAN as shown in the accompanying illustration, you can readily see the disastrous effect of mechanical spacing. The optically spaced arrangement is more easily read, and is arranged so the letters *seem* the same distance apart. In the one marked "Poor Spacing," the distance between the letters is measured, and is the same in all cases. This makes the word hard to read at a glance, and makes some of the letters appear more isolated than others. The secret, then, of correct spacing is that each word must stand out as a unit, and the only appreciable spaces are those left between the words.

A GRECIAN-TYPE CANDLESTICK

J. I. Sowers, Miami, Florida

(See Supplement No. 301)

The candlestick shown herewith was designed with a motif which gives the finished project balance, harmony, and direct, clear-cut, and beautiful lines.

It is turned in three parts as shown at D. The base may be turned on a faceplate; the stem, between centers; and the drip cup and top on a faceplate, and then finished in a chuck. The job, while not too difficult, still affords a nice job of artistic turning. The lines of the turning should be kept clear-cut, and the contour should not be destroyed by overmuch sanding in the lathe.

At B is shown the candlestick after it is carved and put together. The carving is very simple, being fluted in design on the stem, with the same work carried out on the base. These two should match each other, i.e., the fluting on the stem should be opposite that of the base. The stem is carved with a ¼-in. gouge, and a ⅜-in. gouge is used for the base. The gouge is used, as shown at G.

Of course, both the base and the stem are carved before they are assembled. The method of doing the fluting is shown at E, the piece being centered in a jig as shown, the same being held in a bench vise. The pencil gauge fits on both sides of the jig box, and is used for drawing the lines for the flutings. The flutings are laid out on the base of the stem from a strip of paper equal in length to the circumference of the stem at its largest diameter, and on which the spaces for the flutings have been laid out.

Another form of stem is shown at F. The spiral form of stem may be preferred by some, yet it does not conform so well to the classic design of the piece as a whole, as the fluted column. The method of laying out the spiral is shown. This is a *double* spiral, and while the spiral may be made in many different forms, this is perhaps the most pleasing.

The plan of the base is shown at C. From this may be taken the position and size of the carvings on the base.

The candlestick should be made of a selected wood, such as walnut, close-grained mahogany, or any fine-grained cabinet wood that will take a nice finish. It is worth while to select the wood carefully, as this piece represents a good deal of effort, and its beauty will make it a more or less permanent possession.

After staining the finished job a dark walnut or a brown mahogany, it should be given several coats of high-grade varnish, and then given a dull rubbed finish. It also may be given a wash coat of shellac (one part of shellac to four parts alcohol) after staining, and then given an oil finish by applying successive coats of linseed oil thinned with turps, thoroughly rubbed down, day after day, until a fine glow finish is obtained.

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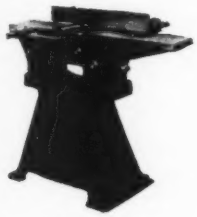

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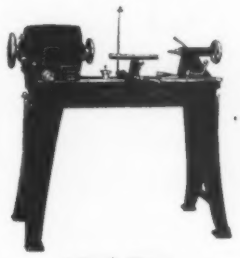

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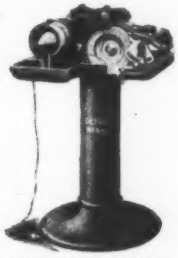

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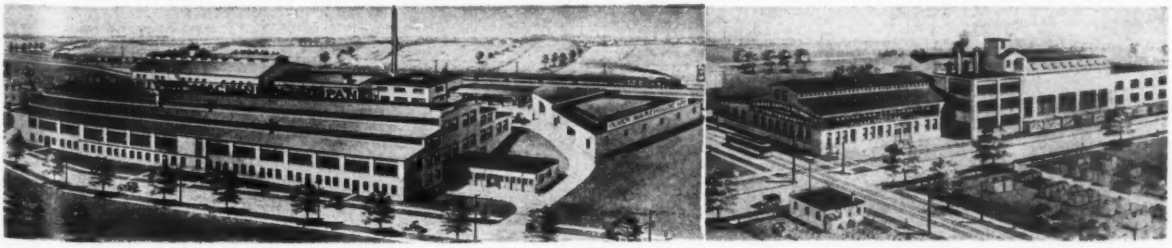

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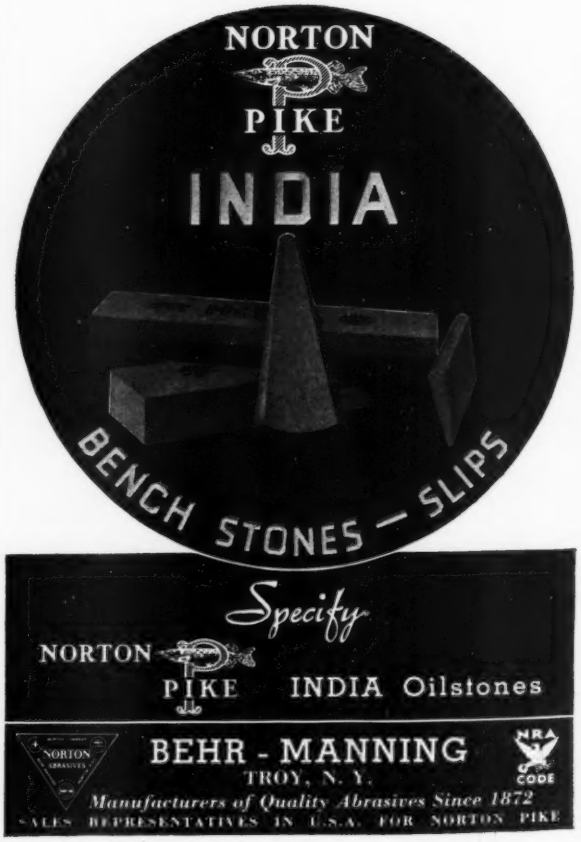

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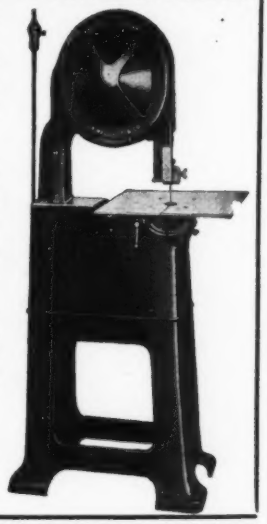

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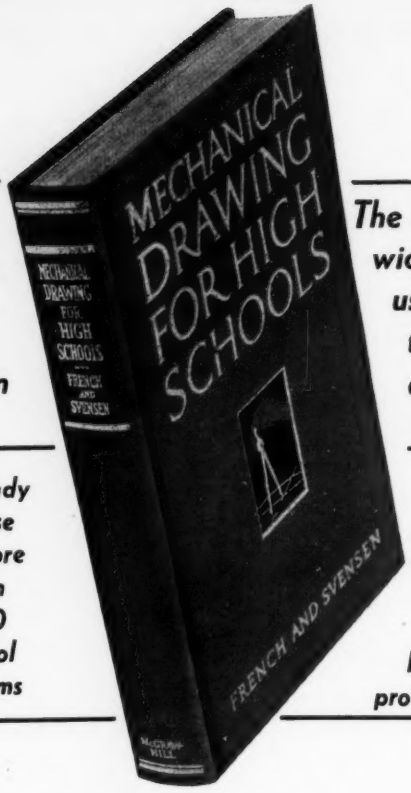

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CHRISTMAS GREETINGS

Our cover picture was chosen because it portrays the spirit of Christmas. In that same spirit, INDUSTRIAL ARTS AND VOCATIONAL EDUCATION reminds every one of its readers of that centuries-old benediction, "Peace to men of good will."

The world at this time needs nothing more than it does peace. Peace between nations, peace between opposing political factions, peace between employers and employees, peace in the family, but above all, peace in the mind and in the heart of the individual.

It is this peace that INDUSTRIAL ARTS AND VOCATIONAL EDUCATION wishes its readers.

THE LAST CALL

The American Vocational Association Convention, which will be held at the Hotel William Penn in Pittsburgh, Pa., December 5 to 8, has been referred to on pages 365, 376, 9A, and 11A in this issue.

In spite of this, we call the reader's attention to it once more. The success of this convention depends upon the attendance of its members. The shop teachers have a duty to perform. They must meet, discuss, and plan their work if the youth of America is to have the best type of modern education.

The convention offers an opportunity for these deliberations. Therefore, attend and assist in solving the problems which confront your profession.

THE ANNUAL INDEX

This issue finishes Volume 23 of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION.

A title page and index have been prepared and will be sent free to any reader upon request.

Articles Indexed—The articles contained in the Magazine are regularly indexed in "The Reader's Guide to Periodical Literature," and "Education Index."

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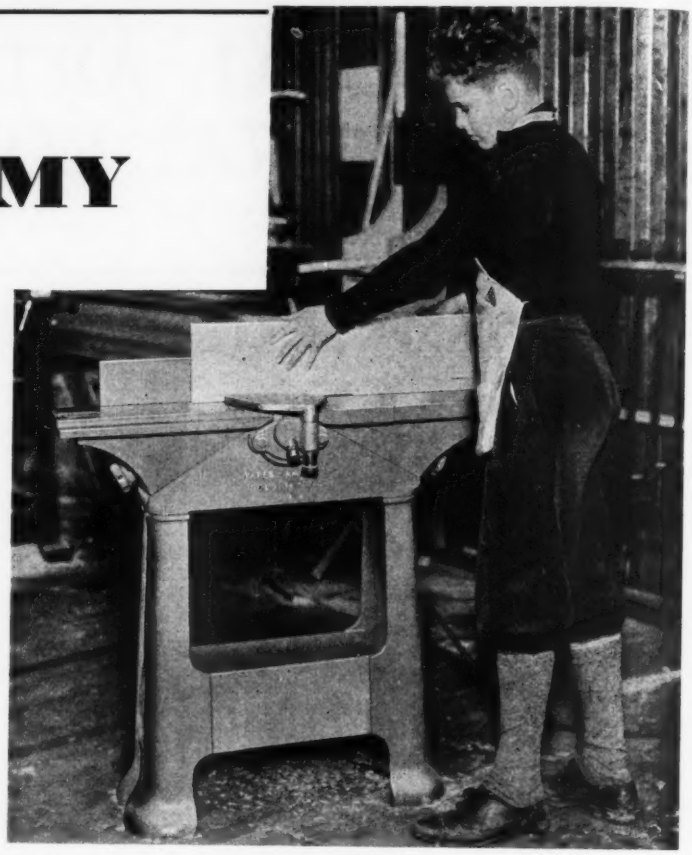
Editorial Contributions—The Editor invites contributions bearing upon Industrial Arts, Vocational Education, Manual Training, and related subjects. Manuscripts, drawings, projects, news, etc., should be sent to the Publication Office in Milwaukee. Contributions are paid for at regular space rates. In all cases manuscripts should be accompanied by full return postage.

The Magazine is on sale at Brentano's, New York; Wanamaker's, Philadelphia; Brentano's, Chicago; Philippine Education Co., Manila, P. I.

SOUND ECONOMY



TO EQUIP your Vocational Training Departments with woodworking machines that are of correct design—strong and highly efficient yet adequately safe; machines that do the full range of work expected of them, that do it with professional fineness and thus inspire high interest and endeavor; that meet fully your present and likely future needs; and that are built for years of faithful, trouble-free service.

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SUBSIDIARY of UNITED STATES STEEL CORPORATION

Jobsheet No. 304

GREETINGS to the MEMBERS of A.V.A.

and a cordial invitation to visit our BOOTH No. 23 at the Convention to be held on December 5th to 8th at the William Penn Hotel at Pittsburgh.

A Display of most timely interest inclusive of the New Materials and Tools, Advanced and Beaten Metal Work Jobsheets is awaiting you there. Don't miss it!

To those who cannot attend, may we say, get acquainted. Ask for free explanatory literature or get our 56 page Catalog for 25 cents refundable with order for $5.

Associations, Conventions

A.V.A. CONVENTION AT PITTSBURGH

Elaborate arrangements have been completed for the meeting of the American Vocational Association, December 5 to 8 in Pittsburgh.

The headquarters for the convention will be in the Hotel William Penn, which is well equipped with banquet halls, committee rooms, and exhibition halls so that there is no necessity of walking long distances, and all activities are under one roof.

The general sessions will be held in the main ballroom, and the sectional meetings will take place in the various committee rooms. The exhibits will be housed in the Urban Room.

The city of Pittsburgh as the convention city, offers an unusual setting. It has many interesting places that permit visitors to combine education with pleasure. There are the Carnegie Institute, the Connelley Trade School, the Girls' Trade School, and many other institutions of higher learning all located in the convention city.

The railroads have offered special reduced rates of one and one-third fare for the round trip, on the identification-certificate plan to members attending the meeting.

The arrangements for the meeting are being rapidly completed by the committee, headed by Dr. Frank M. Leavitt, associate superintendent of schools, Pittsburgh, Pa. The program which is to be both timely and pertinent, will include some unusual features growing out of the programs of the home-economics, part-time trade, and industrial sections. The home-economics section will build its program around the new ideas in home economics developed at the White House Conference.

The apprenticeship plan will be in charge of the part-time trade and industrial-education section. Dr. George F. Hambrecht, director of the Wisconsin State Board for Vocational Education, will have charge of this program.

Dr. R. L. Cooley will have a prominent part in the part-time education section. His address on adult education will be of particular interest at this time.

The program on vocational education and guidance is especially timely. This section, which is in charge of Dr. Edwin A. Lee, superintendent of schools of San Francisco, will have some important features to discuss.

INDIANA INDUSTRIAL-EDUCATION ASSOCIATION TO MEET IN TERRE HAUTE

The Indiana Industrial-Education Association will hold its next annual meeting on March 29 and 30, 1935. At this meeting an important feature will be an exhibit of high-grade teaching material, including a selection of the latest and best textbooks and professional books in the field of industrial arts. The material will be representative of the work put out by well-known publishers in the industrial-arts and vocational-education field.

INDUSTRIAL-EDUCATION CLUB OF FRESNO

The first meeting of the Industrial-Education Club of Fresno for this year, was held on September 1, in the board room of the administration building. At the meeting it was voted to carry out the same general policies in the conduct of the meetings as in the past. It was decided to hold the next meeting on October 19.

Officers elected for the year were as follows: President, Deane Simpson; vice-president, Wiley Hudson; secretary-treasurer, H. J. Bingham.

MEETING OF THE CENTRAL CONNECTICUT INDUSTRIAL-ARTS ASSOCIATION

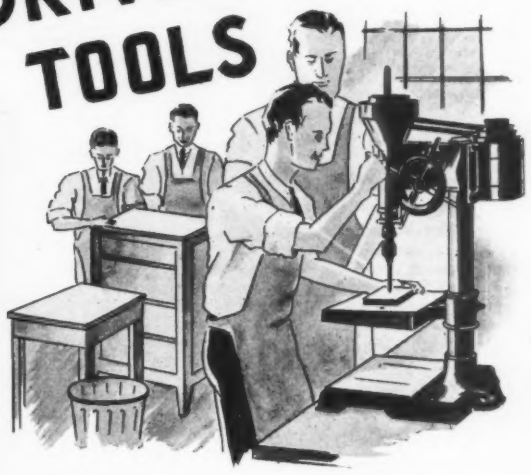
The fall meeting of the Central Connecticut Industrial-Arts Association was held on October 10, at the State Teachers' College, New Britain, with fifty members in attendance.

Following the six o'clock dinner, Dr. Charles Russell, president of the State Teachers' College, Westfield, Mass., spoke on the topic, "The Place of Industrial Arts in the General Educational Program." Dr. Russell predicted that industrial arts would form the foundation from which all subjects would be developed during the coming years.

At the business meeting, a nominating committee was appointed for the election of officers. — *Harry A. Barnicle.*

Thousands of woodworking students are fashioning Christmas gifts with

DRIVER POWER TOOLS



DRIVER Power Tools are humming in hundreds of schools with an air of elf-like industry as Christmas approaches. Students are turning out DRIVER constructed gifts by the thousands! No matter how intricate the design of the table, chair, or novelty, there's a DRIVER Tool to fashion it. Each year an increasing number of schools use DRIVER equipment in teaching their pupils.

Schools which have recently installed DRIVER Power Tools in replacing worn-out or old-fashioned equipment have found the interest of both their pupils and instructors intensified. And little wonder! Every conscientious woodworker wants the best when it comes to tools — that's why DRIVER Power Tools are, by far, the most popular line built; why Byrd chose the DRIVER line for his South Pole Expedition and Seth Parker made the same choice for his memorable trip to the South Seas.

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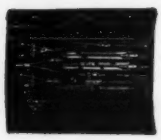

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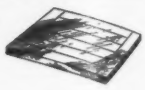

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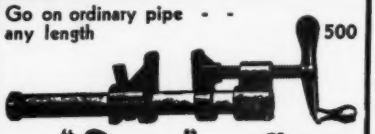

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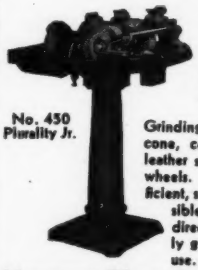

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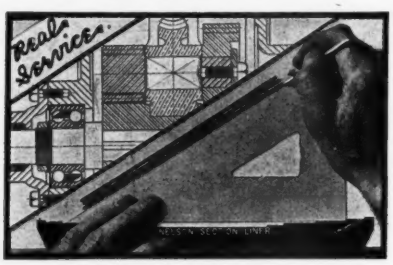

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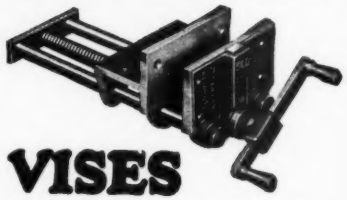

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SchoolShopEquipmentNews

A.V.A. CONVENTION EXHIBITORS

To date, the following have reserved space for exhibits at the American Vocational Association Convention at the Hotel William Penn, Pittsburgh, Pa., December 5 to 8:

American Technical Society, Chicago, Ill.
American Type Founders Sales Corporation, Jersey City, N. J.
Bruce Publishing Company, Milwaukee, Wis.
The Carborundum Company, Niagara Falls, N. Y.
R. L. Carter & Company, New Britain, Conn.
Delta Manufacturing Company, Milwaukee, Wis.
Dudley Lock Corporation, Chicago, Ill.
Manual Arts Press, Peoria, Ill.
McGraw-Hill Book Company, New York City.
Frederick Post Company, Chicago, Ill.
Porter-Cable Machine Company, Syracuse, N. Y.
South Bend Lathe Works, South Bend, Ind.
Stanley Rule and Level Plant, New Britain, Conn.
L. S. Starrett Company, Athol, Mass.
Wrot Iron Designers, New York City.
John Wiley & Sons, Inc., New York City.

It will be to the advantage of those who attend the convention to visit these booths and see what is new in books, tools, supplies, and equipment for the school and the home shop.

A NEW ABRASIVE

The Norton Company, Worcester, Mass., has issued a booklet describing their new product "Norbide," the hardest

(Continued on page 13A)

Enrichment and Diversification for the School Shop Curriculum

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(Continued from page 11A)

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In grain or powdered form, Norbide is used for many grinding and lapping jobs previously possible only with diamond dust. In this form, it may be obtained as fine as No. 800.

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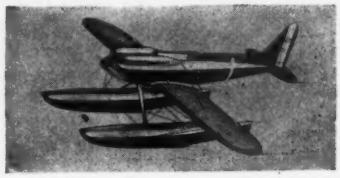

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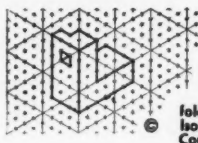

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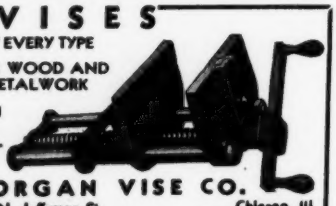

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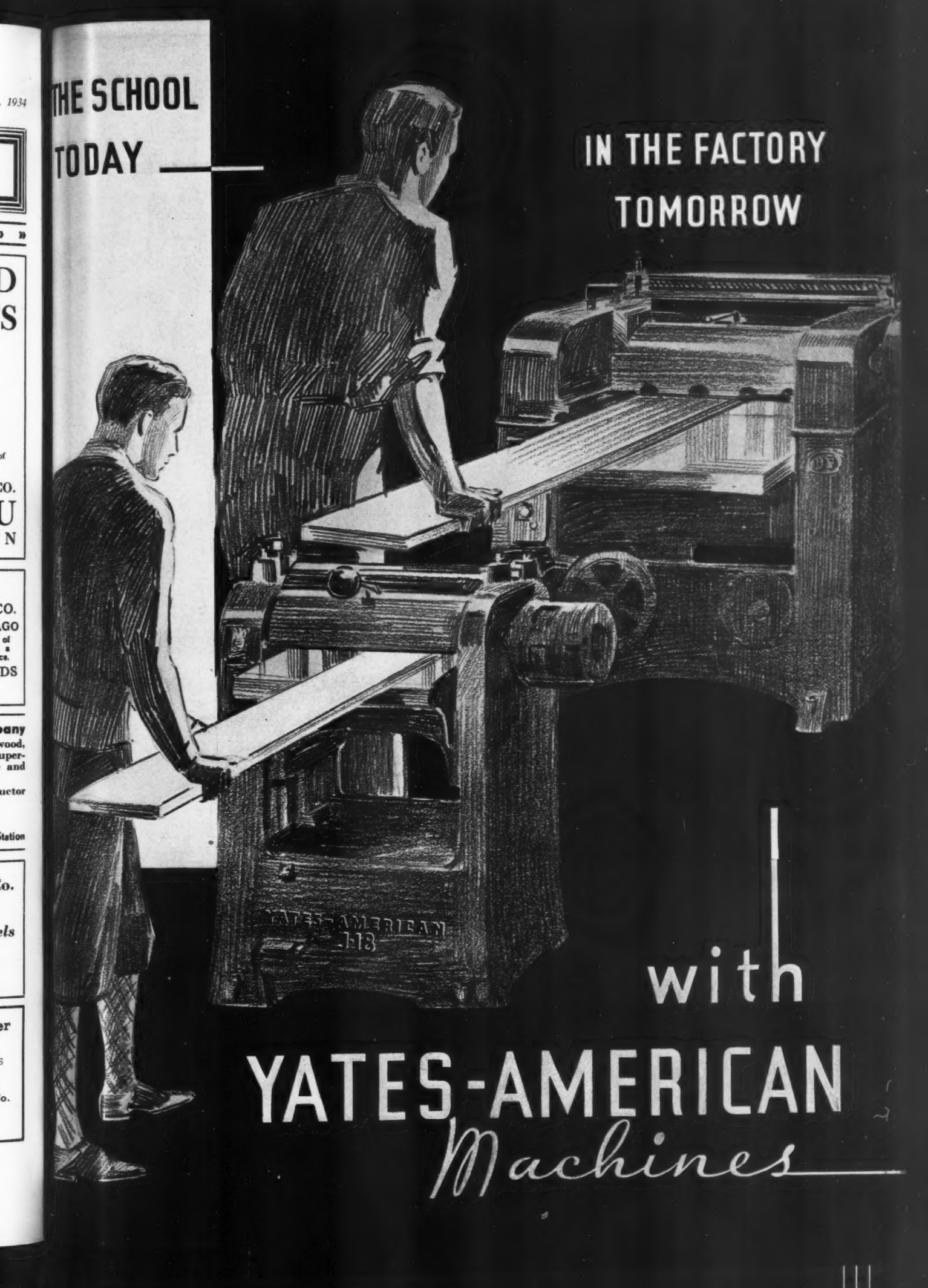
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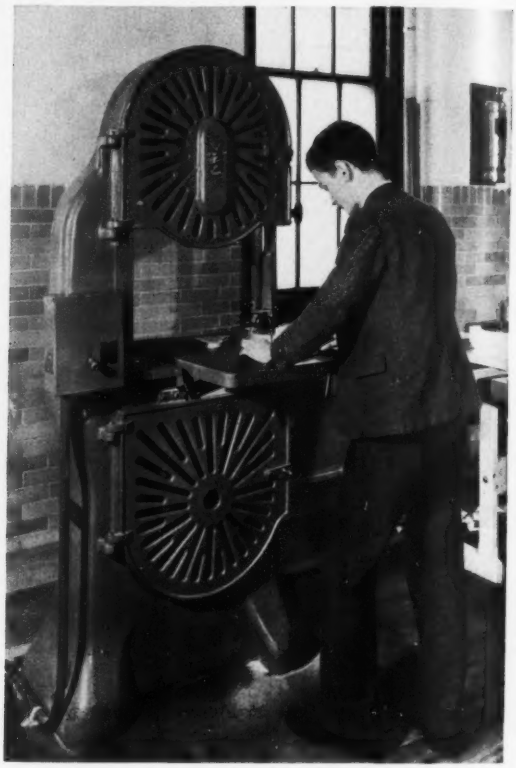
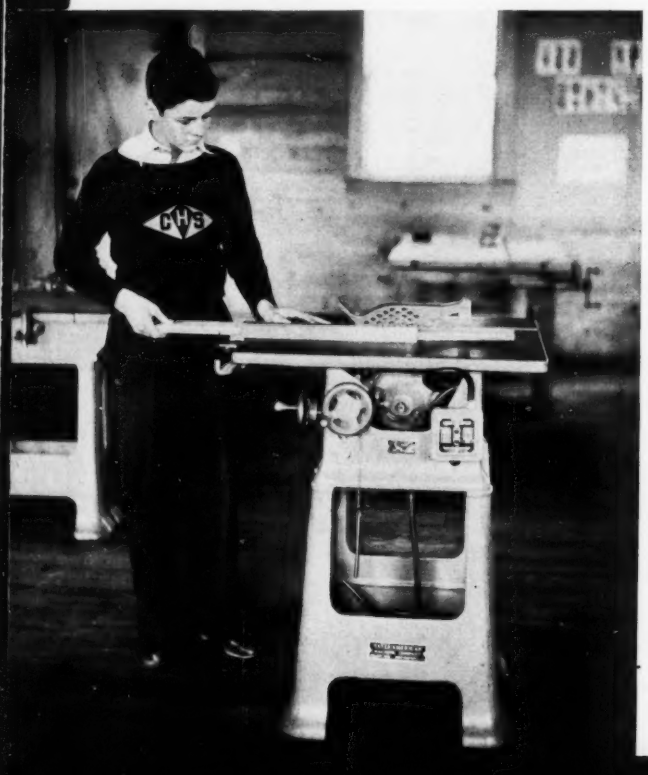


Above:—A group of our new school machines at the New Senior High School at Hannibal, Missouri.

Right:—Y-20 Scroll Band Saw at the Frankford High School, Philadelphia, Pennsylvania.

Below:—J-20 Tilting Arbor Variety Saw at the Concord High School, Concord, N. C.

Below, right:—J-12 Lathe with belted motor headstock at the Central School, Washingtonville, N. Y.



Yates-American
in the School Shop

THERE is a great need in industry for better trained workers — young workers — new blood, new ideas, new methods! Social progress has wrought a tremendous, but very desirable change in our industrial organization by abolishing child labor, by reducing hours of employment, by specializing work, by increasing efficiency—but our old skilled workers are gradually passing out and we have not the material with which to replace them. Where the trained workers of tomorrow are to come from is a problem that faces industry.

The apprentice has practically disappeared from our industrial system. Enlightened social legislation on the one hand and economic limitations on the other have tended to eliminate apprentices from our factories and, consequently, we are not training in industry the workers of tomorrow. And perhaps it is well that this is so, for the industrial apprentice could, in most cases, learn only from immature observation and grudging instruction the operations that came within his limited scope, whereas the worker of tomorrow should be taught both the advanced practice and the approved theory that years of experience has shown to be most efficient.

Industry, therefore, looks to the industrial and vocational school to prepare our young men with practical and technical training to enter the field of industrial work. And to fulfill this mission the school must be adequately fitted.

Because wood is such a universal product, because it is so intimately connected with our daily life, because it is so adaptable to making things by hand with the aid of simple tools, because working on wood is one of the oldest of the arts, woodworking instruction has received an especial place in the curriculum of the vocational school. But if the vocational school is to fulfill the mission which the requirements of industry impose upon it, instruction must have as its goal the training of the boy in the principles of woodworking and in the operation of woodworking machines. And it is here that Yates-American offers its contribution in the way of machines built to meet the requirements of these schools.

In the new era that faces us, when industrial competition will be keener than ever, it is essential that boys be trained on machines similar to those they will be called upon to operate in production plants when they enter the industrial field. Toy-like or hobby machines have no place in the school shop. As Yates-American machines predominate in the woodworking industries the teaching of woodworking on Yates-American school machines is to the student an added assurance of success in his industrial career.

On the following pages we present to educators in the vocational field a group of precision built machines incorporating the advanced design, the scientifically selected materials, the skillful workmanship and the safety features that characterize Yates-American industrial machines. These machines are offered as our contribution to the training of boys for a place in our industrial life where, through their aid, they may be able to earn and enjoy the fruit of their labors.

◆ ◆ ◆

The Important Factors . . .

IN the design of school shop woodworking machinery the factor of safety is of primary importance. Yates-American realizes that school machines will be operated by students from the beginning of their training up through the final stages of their course. School woodworking machines must, therefore, embody enclosed features and every moving part must be guarded.

The factors of capacity and modern design are of next importance. It is because of long and close contact with the school field that Yates-American school machines are built with capacities that will enable students to begin and complete their training on the same machines. Also, Yates-American school machines are provided with operating features to conform to tools that are in use in the large industrial shops.

These things bring us to the next important factor—that of economy in purchasing school machines. Budgets have been decreased and extreme care must be used in choosing your school equipment. Yates-American, in the pages to follow, presents the most economical line of quality-built machines for the school shop.

The band saws pictured here embody all of the features of design affecting operation, control and safety to be found in the larger industrial machines. They are sturdily built of the finest materials and will give years of trouble-free service.

Type J-16 Scroll Band Saw

This is the smallest of our school shop band saws, built to give years of satisfaction.

The frame of the J-16 is a heavy casting, properly ribbed, and contains all of the working parts. This construction assures vibrationless operation and affords the greatest safety to the operator. By removing the base the J-16 may be used as a bench type machine.

The upper wheel is made of aluminum and the lower one of cast iron, both of solid type, 16″ in diameter, rubber faced, and mounted on ball bearings. The upper wheel has vertical adjustment on accurate ways, and being carried on a spring, it provides the necessary tension for the saw. A convenient adjustment permits tracking the saw by tipping the upper wheel. The lower wheel is attached directly to the motor shaft, the complete unit being rigidly mounted.

The wheels are mounted within the saw frame and guarded by a hinged cover. Except at the cutting point the saw blade is guarded its full length.

The table is mounted on a cradle and may be tilted up to 45° to the right and 5° to the left. The pivoting axis is at the saw line and table top. The cradle may be clamped in any desired position.

SPECIFICATIONS

Diameter of wheels	16″
Capacity between saw and frame	15¼″
Maximum capacity under guide with guard on	10″
Longest saw that can be used	9′-5″
Shortest saw that can be used	9′-2″
Widths of saw blades that can be used	⅛″ to ¾″
Table dimensions	20″x22″
Tilt of table	45° to right, 5° to left
Height of table from floor	38½″
Size of motor regularly furnished	½ H.P.
Speed of motor regularly furnished	900 R.P.M.
Weight	675 lbs.

At left:—New J-16 Scroll Band Saw in wood shop — Wm. S. Barr School, Baltimore, Maryland.

Type Y-20 Scroll Band Saw

The Yates-American Y-20 is just a step upwards in size and refinements from the smaller machine described on the opposite page. Although comparatively small, it is a machine suitable for industrial as well as for school use. It will be found particularly suitable as an all-purpose school shop machine.

The frame is a one-piece casting and the illustration at the left shows its apparent rigidity. All working parts are carried within the frame, and because rotating members are accurately balanced, the Y-20 is remarkably smooth in operation. There are no exposed moving parts to endanger the operator. Hinged doors guard every moving part except at the point of cut.

Both 20″ wheels are of the solid type mounted on ball bearings. The upper one is made of aluminum, and its mounting moves in accurate ways on the saw frame. This wheel, carried on a spring provides the means for tensioning the saw. The saw is tracked by tilting this wheel by means of a convenient control. The lower wheel, of cast iron, is mounted directly on the motor shaft and the motor unit attached rigidly to the saw frame to insure permanent alignment.

The reinforced table is carried on a segment and it may be tilted 45° to the right and 5° to the left. A graduated scale permits accurate adjustment, and the table may be clamped in any desired position.

SPECIFICATIONS

Diameter of wheels	20″
Capacity between saw and frame	19½″
Max. capacity under guide with guard on	10″
Longest saw that can be used	11′-10″
Shortest saw that can be used	11′-4″
Widths of saw blades that can be used	⅛″ to 1″
Table dimensions	26″x26″
Tilt of table	45° to right—5° to left
Height of table from floor	38″
Motor regularly furnished, (900 R.P.M.)	1 H.P.
Weight	1150 lbs.

Type Y-30 *and* Y-36 Scroll Band Saws

These are the two finest and heaviest Yates-American Scroll Band Saws, both of which embody exclusive and advanced engineering features of design. While designed for production work in industrial plants they are described briefly here because of their growing use in the larger vocational and part time schools. These machines are of the same general specifications except for such differences in dimensions as would be modified by the use of 30″ or 36″ wheels.

The following features of design place the Y-30 and Y-36 in the front rank of machines of this type.

Totally enclosed aluminum disc wheels; quickly adjustable tilting table; resaw type knife edge device for tensioning saw; modern electric motor equipment including push button switch control; automobile type, braking mechanism for lower wheel; a unique method of attaching rubber wheel bands; built-in dust chute and completely guarded working parts assuring safety to the operator. These features combine to give a smooth running saw at high speeds and assure continuous service for many years.

SPECIFICATIONS

Diameter of wheels	30″	36″
Capacity between saw and frame	29½″	35½″
Maximum capacity under guide with guard on	16″	20″
Longest saw blade that can be used	17′-2″	20′-0″
Shortest saw blade that can be used	16′-6″	18′-8″
Widths of blades that can be used	⅛″ to 1½″	⅛″ to 1¾″
Main table dimensions	28″x30″	36″x36″
Tilt of main table	45° right—10° left	Same
Height of table from floor	38″	42″
Motor regularly furnished, (900 R.P.M.)	3 H.P.	5 H.P.
Weight	2250 lbs.	2730 lbs.

At right:—A Yates-American Y-36 Band Saw is always busy at the Boys' Technical High School, Milwaukee, Wisconsin.

Tilting variety saw tables *are* obsolete!

As vocational schools and manual training shops will be called upon to supply the skilled workmen of the future, it is becoming more important that school shop machinery be of modern design. Obsolete equipment will be just as much out of place in the school shop as in the modern industrial plant.

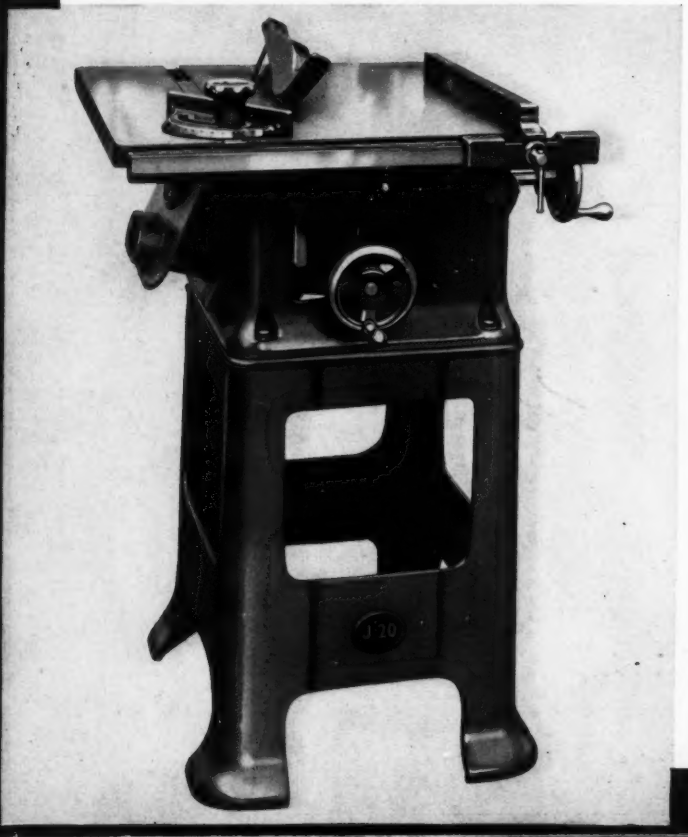
Obsolescense can be clearly pictured by comparing the tilting table variety saw of a few years ago, with the new Yates-American saws described here, in which the arbor tilts while the table remains stationery. This design not only widens the range of the machine but also affords greater ease and safety of operation and increased output.

The three models listed are especially suitable for school shop use. They are modern in every respect and will greatly increase the value of your instruction in woodworking. Every school shop should have a tilting arbor variety saw.

Type J-20 Tilting Arbor Variety Saw

The J-20, pictured here, has been designed for accurate work and is a tool of many uses. Within its range its operation will compare with the larger machines of similar type.

The frame, is a one-piece casting, heavily ribbed, and whether mounted on a bench or on the standard floor stand, the J-20 will stand up solidly to all work within its capacity.



The table 25″x30″—is heavy, accurately machined, and has a removable throat plate for easy access to the spindle when changing saws. Dado heads up to 1″ wide may be used.

The saw arbor is of alloy steel, accurately ground, and mounted on ball bearings and also serves as the rotor shaft of the motor. The saw unit—motor, saw spindle and saw—is adjustable up or down within a range of 2½″. Also the motor and saw unit tilts up to a 45° angle and may be clamped rigidly at any position within this range. All controls are conveniently located within reach of the operator.

The motor is of the constant speed type driving the saw at 3600 r.p.m. It is totally enclosed, fan cooled, dust proof, and mounted on ball bearings. A ½ H.P. motor is regularly furnished, suitable for all usual current specifications.

A dust chute is built into the saw unit with outlet convenient to the exhaust system or for hanging a bag.

One mitre cut-off gauge, one double face ripping fence, one splitter and saw guard, one 10″ diameter 18 gauge combination rip and cross cut saw, and one floor stand are regular equipment. A 1 H.P. motor can be supplied on special order.

SPECIFICATIONS

Regular table dimensions	25″x30″
Regular size of motor, 3600 r.p.m.	½ H.P.
Depth of cut, maximum	2½″
Width of rip to left of saw	11″
Width of rip to right of saw	12″
Width of cut-off	13″
Maximum width of dado head	1″
Diameter of saw blade	10″
Diameter of saw arbor where saw goes on	⅝″
Arbor tilts	45°
Height of bench type machine	12½″
Height of machine with floor stand	36½″
Weight	335 lbs

Type G-89 Tilting Arbor Variety Saw

The Yates-American G-89 Direct Motor Driven Variety Saw, with tilting arbor, is designed to meet the production and stamina requirements of industry generally. You will find it in use in furniture factories, cabinet shops and many other branches of the woodworking industry. It is because of its wide use in industry that many school shops are turning to the G-89 as the ideal machine for instruction purposes.

The tilting arbor feature, not only widens the range of the machine but also affords greater ease and safety of operation, resulting in increased production.

The rotor of the high speed motor is mounted directly on the saw arbor, and there are no gears or belts to cause loss of power. The motor is totally enclosed, fan cooled, and dust proof, assuring continuous service. This is an exclusive feature.

It is built on a sturdy one-piece frame with clean cut lines without projecting parts. Skillful design, fine materials, and careful workmanship, make the G-89 Saw an extremely accurate machine for all sawing operations requiring straight or bevel cuts.

Standard equipment includes—one 16″ combination rip and cut-off saw; 2 graduated swivel cut-off gauges; one double-faced box rip gauge; one 1⅛″ detachable end for dado heads up to 3″ wide. The motor is 5 H.P. for 2 or 3 phase, A.C. with push button switch control.

SPECIFICATIONS

Table dimensions	40″x44″
Height of table from floor	34½″
Regular size of motor	5 H.P.
Speed of saw, r.p.m.	3600
Depth of cut, maximum with 16″ saw	4⅛″
Width of rip to left of saw	15″
Width of rip to right of saw	26″
Width of cut-off	23″
Maximum size of dado head	12″x3″
Diameter of saw blade	16″ or 18″
Diameter of saw arbor where saw goes on	1⅛″
Tilt of saw arbor	up to 45°
Weight	1600 lbs.

Type G-91 Tilting Arbor Variety Saw

The Yates-American Type G-91 Double Tilting Arbor Saw is the foremost machine of its kind—just about the last word in variety saw design. It has two saw arbor units, with individual 5 H.P. motors, which revolve on a cradle within the frame of the machine, so that either the rip saw or the cross-cut saw can be brought up quickly to operating position. Extra heavy saw arbors also serve as the rotor shafts of the motors. The motors are totally enclosed, fan cooled, dust proof and run in ball bearings.

The machine is provided with gauges and adjustments to enable the operator to make the necessary set-ups easily and accurately. It will cut a true mitre, will cut off to length, and rip to width, all without previous calculation.

The G-91 is a high grade precision tool throughout, and because of the tilting arbor feature, the table is always level, permitting the operator to handle all work with ease and safety while standing in a convenient position.

The G-91 will rip up to 26″ wide and cut off up to 31″ wide. It will take 12″ diameter dado heads up to 2½″ wide and with a 16″ saw will cut through stock 4⅛″ thick. It is completely equipped with two motors, two saws, a universal micrometer ripping fence, one mitre pin-stop cut-off gauge and two mitre cut-off gauges; also cut-off gauge rod. Spreader gauge is attached to rip-saw arbor and swings around with it.

SPECIFICATIONS

Table dimensions	40″x48″
Roller table, width	17″
Height of table from floor	35″
Saw motors	2 of 5 H.P.
Speed of saws, r.p.m.	3600
Depth of cut, maximum with 16″ saw	4⅛″
Width of rip to right of saw	26″
Width of cut-off	31″
Maximum size of dado head (On special order 12″x3″)	12″x2½″
Diameter of saw blades	16″ or 18″
Diameter of saw arbors where blades go on	1⅛″
Tilt of saw arbors	up to 45°
Weight	2640 lbs

3 Modern Lathes *to meet all* school requirements

IT has been said that the lathe, because it is more closely akin to the art side of the student than any other woodworking machine, claims his highest interest. With it his skill in forming articles of use and beauty is challenged, for what he accomplishes depends almost entirely upon himself. That is what makes the lathe so interesting and so essential to the equipment of the woodworking department of a school shop. The process of turning will always be the center of interest among boys.

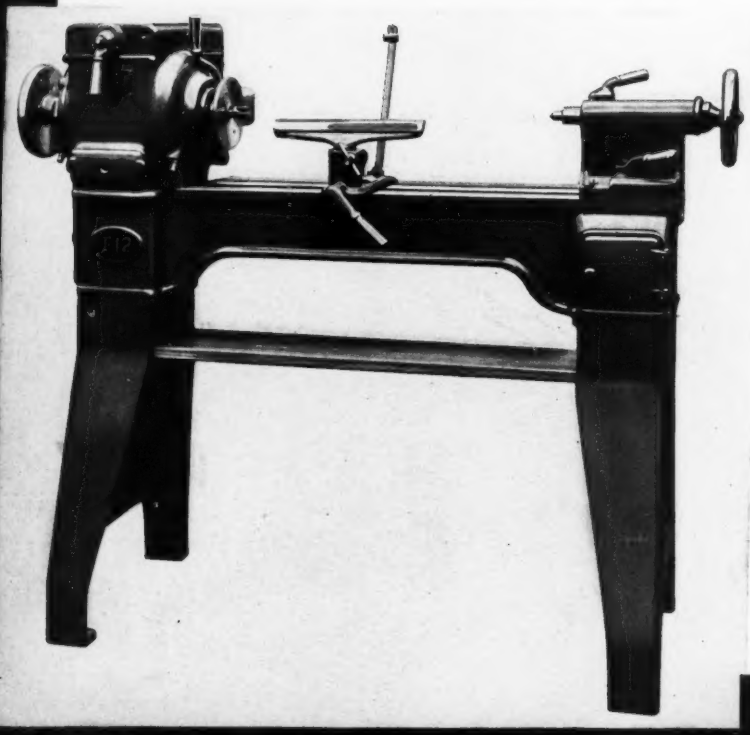
A lathe is among the first equipment purchases of every trade school, and because it is so widely and continuously used, the greatest care should be taken in its selection. Matters of precision, rigidity, inbuilt quality, potential life, and safety should be considered carefully, for the lathe that is bought today will probably be expected to serve your school for many years.

In presenting to the school field the three lathes described here, Yates-American has anticipated from the viewpoints of design and quality, the needs of those who purchase for school shop use.

We have attempted to eliminate for them all elements of guess-work in their selection, for there really is a difference in lathe equipment. Each of these lathes has a definite place in the school shop. They are all thoroughly modern in design and built to give years of satisfactory service. That is why so many manual training shops have standardized on Yates-American lathes.

Back of every Yates-American woodworking machine for the school, is the engineering and manufacturing experience of the world's largest organization engaged in the manufacturing and selling of woodworking machinery.

Type T-12 Speed Lathe with 4-Speed Motor Headstock



The Yates-American T-12 is the successor of the No. 12 Speed Lathe that has long been the most popular lathe for school shop use. The new T-12, with many refinements of design and construction, and many features never before incorporated in a lathe of this type, is the last word in convenience of operation and safety.

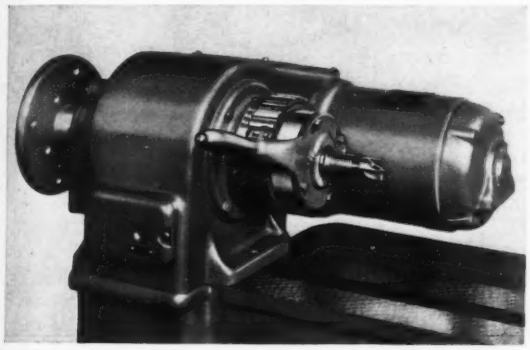
Among its unusual features are the safety control that protects against accidental starting, the direct drive four-speed motor, the quick-acting brake that cuts off the power when applied, the positive spindle lock for use when changing plates, the new tool rest lock, and the clamping device for the tailstock spindle. All of these features have a strong appeal both to the instructors and the students of vocational and manual training schools.

SPECIFICATIONS

Direct motor drive, 4-speed motor, ½ H.P., 600, 1200, 1800 and 3600 R.P.M., completely enclosed motor control.
Bed:—48" long with 26" between centers. (Also longer beds.)
Regular equipment:—One 5/8" cup center, one 1" spur center, one 6" hand tool rest, one 12" hand tool rest, one rear tool shelf, one 8" rear face plate and handwheel, one 6" front face plate, one 3" rosette chuck, one blueprint holder, one center drift rod, one square hollow chuck and one face plate wrench.

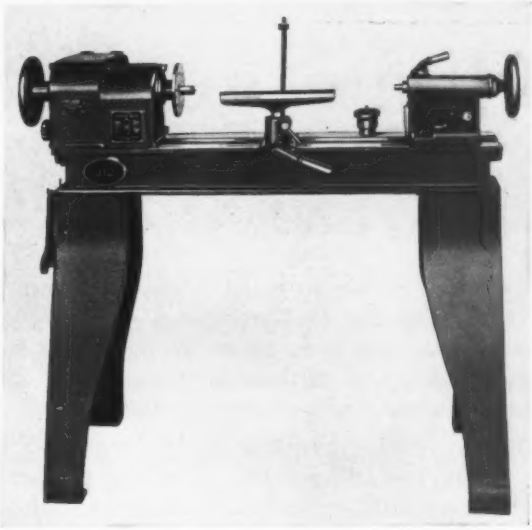
Variable Speed Lathe

There is an apparent need for a lathe with a variable speed headstock affording wider range of turning speeds than that given by lathes driven by four-speed motors. Yates-American engineers have given considerable thought to a lathe possessing this feature, one that would also incorporate all the advantages of operation and the safety features that school instructors demand. Paramount among these safety features is the impossibility of starting the motor at any of the high speeds, to eliminate the danger of having the work on the lathe flung away with the resulting possibility of injury to the operator. Among the many features that will make this new lathe a favorite with school instructors is the arrangement whereby the motor cannot be started except when the speed control lever is set at the lowest spindle speed, 500 r.p.m. This is an exclusive Yates-American safety feature.



The headstock spindle is driven by a ½ H.P. single speed motor through a variable speed "V" belt drive with the selection of speed controlled by means of a hand lever. The complete control of the speeds of the headstock spindle, including braking, is accomplished by means of this lever. When set at the lowest spindle speed, 500 R.P.M., it releases the starting push button, enabling the operator to start the motor and, once the motor has been started, this lever can be moved up or down within the full range of speeds, in order to select the one best suited to the work. When this lever is brought down to the stop position, it shuts off the current on the motor through an interlock with the electric switch. Further pressure on this lever will apply a brake to the spindle.

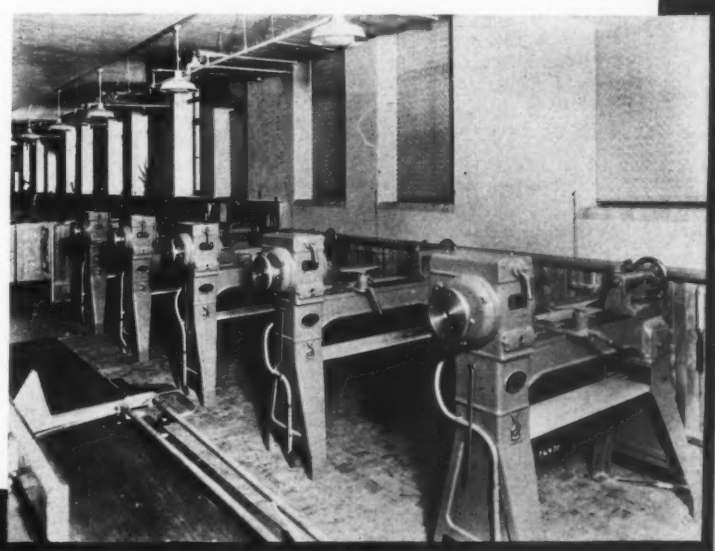
This mechanism gives a choice of many spindle speeds between the minimum of 500 and the maximum of 3,000 R.P.M. The motor is of the squirrel cage type, fully enclosed within the headstock housing, and the entire mechanism is built to give long and satisfactory service. There is nothing in its construction that will get out of order or give trouble of any kind. A convenient stop pin locks the spindle for removing or attaching face plates. The complete unit is mounted on the bed of the well known T-12 Lathe.



Type J-12 Belted Headstock Lathe

One of the famous "J" line of Yates-American machines for school shop and light manufacturing use, the J-12 Speed Lathe is a compact, sturdy machine that will give a good account of itself under the most exacting conditions. It is built with the same precision and care as the T-12 described on the opposite page, differing principally in the manner of driving the spindle. A ½ H.P., 1800 R.P.M. motor, hinged to the back of the headstock, drives the spindle with a V belt. Both the motor and the spindle have two-step cone sheaves, the motor being so arranged that either step on the motor sheave may be lined up with either step on the arbor sheave, thus giving four spindle speeds of 750, 1250, 1540 and 2400 R.P.M.

The tailstock, although of conventional design embodies several new features and the spindle clamp is of improved design. Built in all regular sizes.



At right:—A battery of five Yates-American T-12 Speed Lathes adds an "industrial" touch to the woodworking shop of Juneau Junior High School, Milwaukee, Wisconsin.

Three good Surfacers ... *from which* to choose

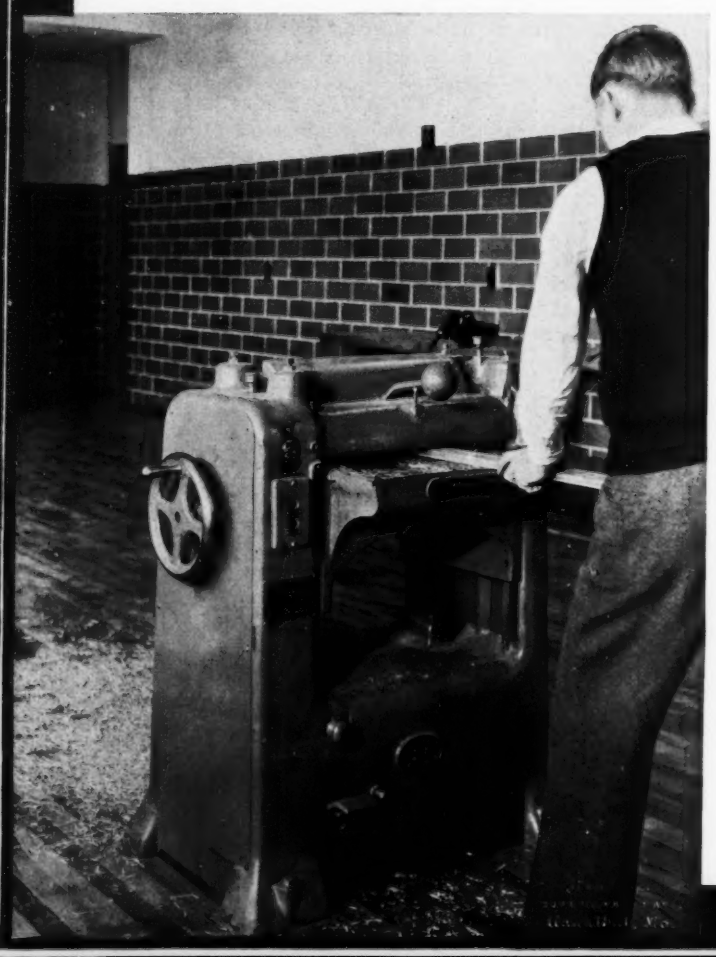
A LINE of woodworking machines, designed to meet the requirements of the modern manual training and vocational school, would not be complete without a planer or single surfacer.

Planing cabinet panels and other large surfaces to uniform thickness was formerly a tedious hand operation, entirely out of step with school shop "production" that is now necessary with many students and crowded conditions. The ultimate aim of every school woodworking shop should be to completely modernize every department so that they form a well balanced group with no department lagging behind.

There are three Yates-American Single Surfacers that are particularly suitable for the school shop. All of them have proved their merits in manufacturing work and many of each type are giving highly satisfactory service in the vocational school field.

Any one of the machines described here will materially add to the value of your course of training students in the art of woodworking.

Type J-18 Single Surfacer



The J-18 is a compact, sturdily built single surfacer, designed especially for the range of work found in the average school and pattern shop. It is the result of many years of experience in building surfacers of many sizes and for many purposes. It is truly a high grade machine in every respect.

As with all the other machines of the "J" line, safety has been one of the principal objectives of our engineers and every moving part is fully enclosed. There is no chance for the inexperienced operator to be endangered by belts or gears. Chief among its outstanding features are the one-piece frame including top girt, ball and roller bearing equipment throughout and the built-in motor drive.

The J-18, while smaller in size than any of our other surfacers, will produce the highest quality of work and is remarkably easy to adjust and operate. It cannot be compared with other small surfacers because its advanced design, its up-to-date construction and its fine workmanship place it in a class by itself, as the finest single surfacer built for the small shop, the vocational school and the pattern shop.

SPECIFICATIONS

Capacity, width	18"
Capacity, thickness	⅛" to 6"
Shortest stock, butted	3"
Shortest stock, not butted	8¾"
Diameter of cutterhead	3½"
Number of knives in cutterhead	3
Speed of cutterhead	3600 R.P.M.
Diameter of feed rolls	2½"
Rates of feed per minute	15 and 30 ft.
Size of motor regularly furnished	3 H.P.
Weight	1500 lbs.

At left:—A J-18 Yates-American Single Surfacer is a part of the modern equipment in the High School at Hannibal, Missouri.

Type B-8 Single Surfacer

24 and 30 in. wide

In the new type B-8 Single Surfacer, Yates-American has incorporated refinements of design and construction that make it the finest machine of its type. It is compact—everything is built-in—the only projecting parts being the motor on the motor driven machine and the guarded pulley on the belt driven model. All of the working parts are fully protected from dust and dirt, and because everything is enclosed, there is nothing to endanger the operator.

On the motor driven machines, the motor is built in with the rotor mounted directly on the cutterhead spindle. The rotor is short and the motor mounting very compact and rigid. The supporting bracket is mounted directly on the cutterhead box cap, eliminating all adjustments of the motor mounting.

It is made in two sizes—24″ and 30″ wide—and takes stock up to 8″ thick. It is remarkably easy to adjust and operate and produces work of the highest quality.

To summarize—a new, cleancut design—no overhanging parts—rugged construction—easy adjustment—enclosed cut gear feed works—bronze bushings for all shafts—ball bearing cutterhead—smooth performance and dependability make the type B-8 the ideal machine for all work within its capacity.

SPECIFICATIONS

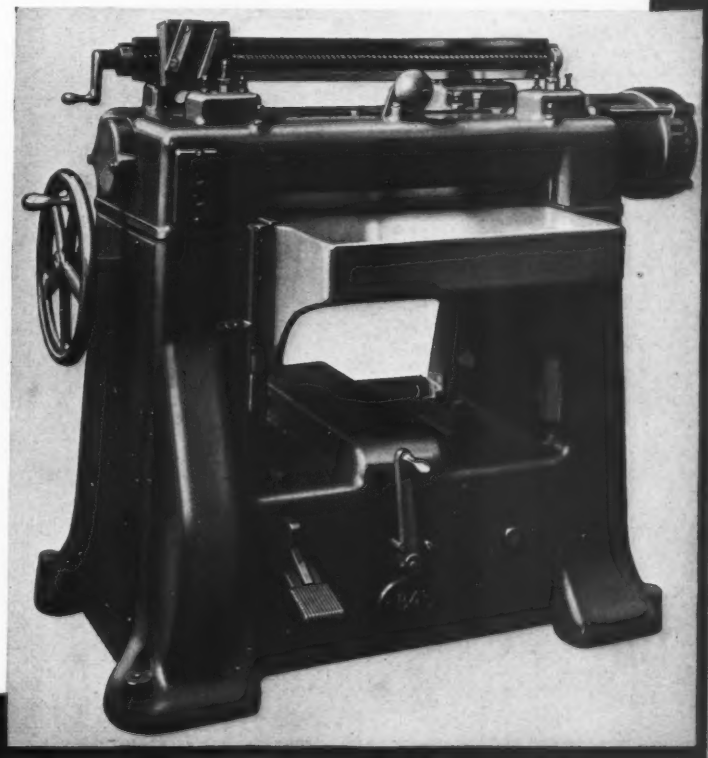
Capacity, width	24″ and 30″
Capacity, thickness	⅛″ to 8″
Shortest stock, butted	4″
Shortest stock, not butted	14″
Diameter of cutterhead	5⅛″
Number of knives in cutterhead	4
Speed of cutterhead	3600 R.P.M.
Diameter of feed rolls	5″
Rates of feed per minute	20 and 40 ft.
Size of motor regularly furnished	24″—10 H.P. 30″—15 H.P.
Weight, 24″	3000 lbs.
Weight, 30″	3300 lbs.

Type B-4 Single Surfacer

The things about the B-4 Single Surfacer that immediately attract the experienced woodworker are its well proportioned lines and cleancut appearance. It might well be placed at the head of the list as the most suitable surfacer for the school shop—a heavily built machine with slightly greater capacity than the J-18 and within the range of the average industrial plant, pattern and job shops, as well as the vocational school.

Nothing has been sacrificed to make it a high grade machine in every respect. As is true with all other Yates-American machines, safety of design has been watched carefully. Every moving part is enclosed and there is nothing to endanger the operator.

Space here does not permit describing the features of the B-4 as they deserve . . . The one-piece frame; the bed with finger-tip adjustment; the feed drive; the power driven feed rolls; the improved chipbreaker; the three-knife cutterhead and the method of motor drive and control all merit your investigation.



SPECIFICATIONS

Capacity, width	24″
Capacity, thickness	⅛″ to 8″
Shortest stock, butted	3¼″
Shortest stock, not butted	11″
Diameter of cutterhead	4¼″
Number of knives in cutterhead	3
Speed of cutterhead	3600 R.P.M.
Diameter of feed rolls	4″
Rates of feed per minute	20 and 40 ft.
Size of motor regularly furnished	7½ H.P.
Weight	2700 lbs.

Yates-American . . . . HAND JOINTERS

Type J-31 Hand Jointer

The great variety of work that can be done on a hand jointer depends very largely upon the knowledge and skill of the operator. In this fact lies the value of this tool as a part of school shop equipment—second only to the lathe. It lends itself to so many operations that the student gains much in knowledge and efficiency.

The Yates-American Type J-31 Hand Jointer pictured below, at left, is a precision tool designed for small work such as is found in pattern shops and manual training schools. The base is of the box type made of cast iron. The tables are made of cast iron, well ribbed accurately machined and ground to a smooth finish so that stock will slide easily. The outfeed table is arranged for rabbetting, and both are adjusted by means of handwheels.

A safety cylinder cutterhead and the motor connected direct to the cutterhead arbor and running on ball bearings are other important features of J-31 construction.

Because of its wide range of usefulness, the matter of safety is of more than ordinary importance in the design of a hand jointer. Safety to the operator has been foremost in mind in the design of this machine. School shop instructors will recognize the value of the safety features.

SPECIFICATIONS

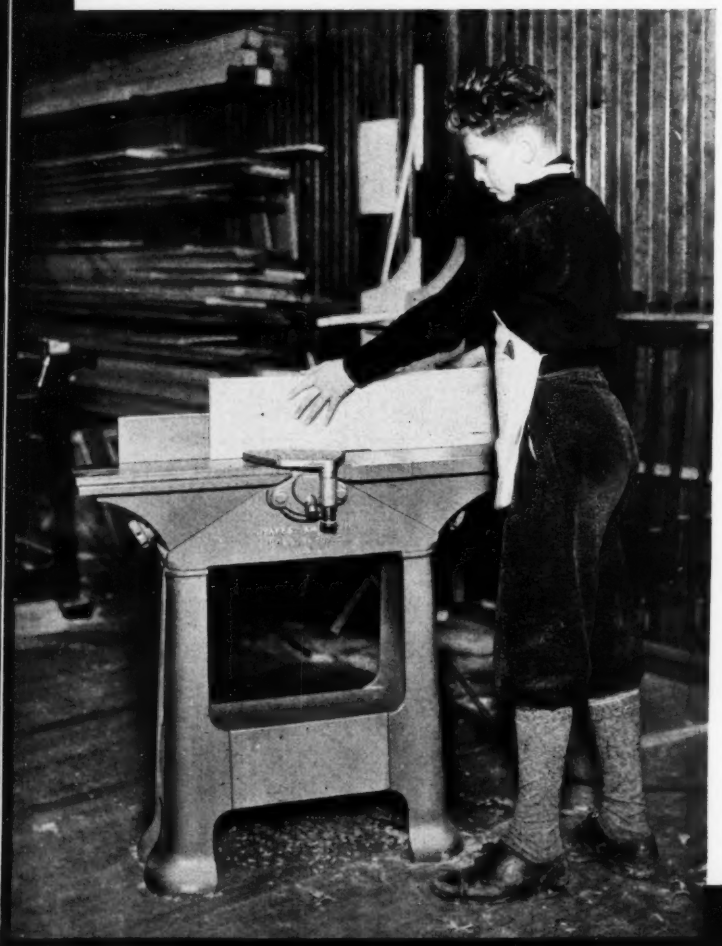
Table length	42"
Table width	6" and 8"
Height of bench machine	7½"
Height of machine with floor stand	31½"
H.P. of 6" machine	1
H.P. of 8" machine	¾
Cutting circle of cutterhead	3¼"
Number of knives on cutterhead	3
Adjustable fence, tilts	45°
Speed of cutterhead, direct motor drive	3600 R.P.M.
Weight of bench machine, 6"	225 lbs.
Weight of bench machine, 8"	265 lbs.
Weight of machine with pedestal, 6"	285 lbs.
Weight of machine with pedestal, 8"	345 lbs.

Type B-11 Hand Jointer

The B-11 Hand Jointer is a precision tool, made for those who demand a product of the highest quality. The tables are ground to a glass-like finish and are mounted on carefully fitted inclines, locked in position by hand levers. The tables are equipped with steel lips on the edge facing the cutterhead. For many years it has been a favorite of manual training and vocational school instructors.

SPECIFICATIONS

Table length	50"
Table width	6" and 8"
Height of bench machine	9½"
Height of machine with floor stand	33"
H.P. of 6" machine	½
H.P. of 8" machine	1
Cutting circle of cutterhead	3¼"
Number of knives on cutterhead	3
Speed of cutterhead, direct motor drive	3600 R.P.M.
Speed of cutterhead. belt drive	6100 R.P.M.
Weight of bench machine, 6"	305 lbs.
Weight of bench machine, 8"	395 lbs.
Weight of machine with pedestal, 6"	430 lbs.
Weight of machine with pedestal, 8"	520 lbs.



Left—A Yates-American J-31 Hand Jointer is the busiest machine in the woodworking shop at Garrison Junior High School, Baltimore, Md.

Type U-900 Router

Carved and intricate cutout designs in furniture have made the router a necessity in the woodworking industry.

Aggressive school shop instructors should consider the possibilities of the router for advanced instruction in woodworking in the vocational school, to better prepare students for their work in industry. Many things can be done with it, and it opens up a new field of opportunity for the school instructor to teach new and unusual operations in woodworking.

The Yates-American U-900 Router pictured here is the ideal machine of its type for school shop use. Except for its smaller capacity it has all of the refinements and built-in quality of the larger Yates-American machines that are extensively used in industry.

The U-900 has built-in motor drive, free running spindle and smooth operating spindle brake. Its capacity—15″ throat clearance and 5″ between the table and spindle, is ample for the usual work in the school shop.

It is convenient to operate and contains every safety feature, with the point of cut in clear view of the operator. Because of its high speed spindle, it cuts freely and cleanly, requiring very little feeding pressure, thereby minimizing the possibility of accident to the operator.

Outstanding Features of the J-50

Heavy one-piece box type base—supports table and slide for motor unit.

Heat-treated and heavily rimmed table to prevent warping.

Heat-treated alloy steel spindle running in precision type, oil lubricated ball bearings.

Friction band type brake for quick stopping of spindle.

Maximum protection against danger to the operator.

Type J-50
Single Spindle Shaper

A shaper can be a dangerous machine for boys in a school shop, or one of safety and great usefulness, depending upon the skill with which its designers have guarded the cutter knives without interfering with flexible operation. The Yates-American J-50 is the ideal shaper for the school shop and will prove to be extremely useful for cabinet and furniture work in advanced classes. It will produce high quality work in the making of mouldings and other irregular contours, and is easy to adjust and operate.

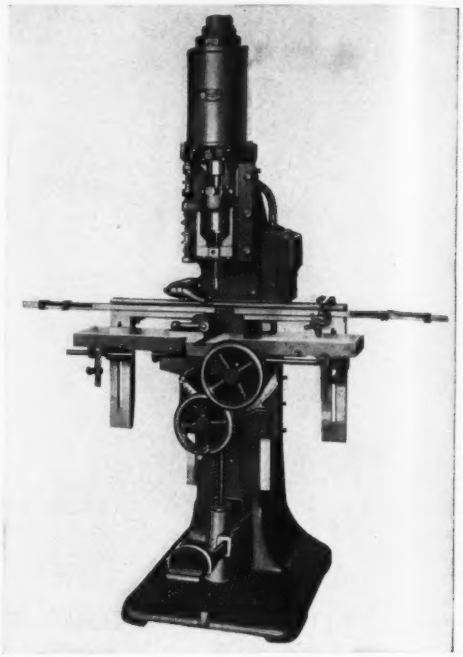
A one-piece heavy cast iron base supports the table which is accurately machined and heat treated to prevent warping. A unique and highly desirable feature is the guard for the cutterhead. This consists of a sleeve, supported from the back of the table by a rigid overarm, which entirely surrounds the cutter and is adjustable to expose only as much of the cutter as desired. A holddown shoe mounted in front of the guard holds stock firmly to the table and further protects the operator from the cutter.

SPECIFICATIONS

Size of table	30″x38″
Height above floor	36″
Spindle—from front edge	13″
Spindle—handwheel vertical adjustment	5″
Spindle speed	8500 R.P.M.
Motor—3600 R.P.M.	2 H.P.
Weight	950 lbs.

At right:—Yates-American type J-50 Single Spindle Shaper.

Type K-25
Hollow Chisel Mortiser



The Yates-American K-25 is designed for mortising in hard or soft woods and is of suitable capacity to handle the usual range of square or oblong mortising to be found in small industrial plants, pattern shops and schools.

It has been the purpose of the designers of the K-25 to produce a high speed mortiser that is convenient and economical in operation, safe and thoroughly dependable. All ordinary adjustments are quickly made without the use of wrenches. Control levers and handwheels are all convenient to the operating position.

Of special importance is the stationary mounting of the motor which is attached directly to the spindle. The spindle that drives the bit is a splined shaft that slides up and down within the rotor shaft of the motor.

SPECIFICATIONS

Capacity:—This machine will mortise up to ⅝" square in hardwood and ¾" square in softwood, 3½" deep with 12" clearance under the chisel and will mortise in the center of material 6" wide.

Chisel Ram:—Operates by footpower. The spindle has ball bearings and rotates at a speed of 3600 R. P. M.

Drive:—Motor mounted directly on spindle.

Equipment:—Three chisels furnished; one each ⅜", ½" and ⅝" with 4" blades and with bits to correspond. Two chisel bushings, 1⅛" O.D., ⅜" and ¾" bore, and an adjustable bit bushing 1¼" bore x ¾" O.D. will be furnished.

Type J-40
Hollow Chisel Mortiser

The J-40 is a light vertical hollow chisel direct motor driven mortiser for light mortising in hard or soft woods, using chisels up to ½" square. It is especially recommended as the ideal machine for pattern shops and vocational schools.

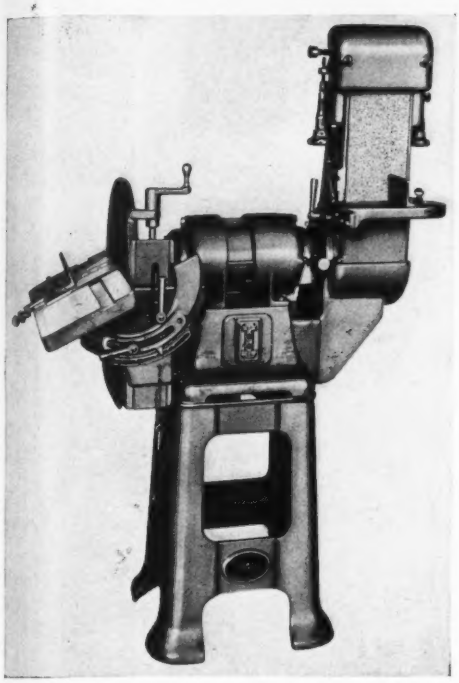
The J-40 is an unusually easy machine to adjust and operate, handwheels being provided to raise and lower the table and for cross adjustment. It can easily be converted into a borer, and because it is a dual purpose machine it will add much to the efficiency of the school woodworking shop.

The J-40 is a sturdy quality built machine capable of producing the finest work. It has cleancut lines with all operating parts enclosed and will give trouble free, dependable operation for many years.

SPECIFICATIONS

Size of mortise	up to ½"
Size of stock, high	up to 22"
Will mortise to center of stock	8½" wide
Maximum distance between chisel and table	22"
Motor	½ H.P.
Special motor	1 H.P.
Stroke, maximum	4⅛"
Table size	30"x6"
Table tilts, right or left	45°
Vertical adjustment of table	18"
Cross adjustment	3½"
Table height, maximum	45¼"
Weight	460 lbs.

At left:—A Yates-American J-40 installed in Merrill Junior high school woodworking shop, Oshkosh, Wisconsin.



Type J-47
Disc and Belt Sander

The type J-47 Combination Disc and Belt Sander consists primarily of a double end motor mounted on a base to which may be attached the belt sander, disc sander, drum sander or grinder units to make up a complete machine.

The belt sander unit is furnished for the right hand side of the machine only. A unique feature is that the belt may be used in either the horizontal or vertical position.

The disc sander unit can be supplied for either the right or left side and consists of a 15″ diameter disc mounted directly on the motor shaft.

A drum sander unit and a grinder unit, to fit either side of the machine, complete this unusual machine which is almost universal in application and a very desirable addition to school shop equipment.

SPECIFICATIONS

Drive:—Direct motor drive includes either ½ or ¾ or 1 H.P. (as required), 1800 R.P.M., totally enclosed, fan cooled, ball bearing motor with push button operated control having overload protection.

Belt Sander Unit:—Belt 6″ wide, 59″ long, speed 3770 F-M, two belts furnished. Driving pulley 8″ diameter, driven pulley 4″ diameter. Table 5″x12″. Tilts 45 degrees down, 30 degrees up. Angle gauge furnished. THIS UNIT FOR RIGHT HAND ONLY.

Disc Sander Unit:—Disc 15″ diameter. One extra furnished. Table 9″x20″. Tilts 45 degrees down, 15 degrees up. 6″ vertical adjustment. Six abrasive discs and one can of cement. Angle gauge and core print gauge furnished. THIS UNIT FOR RIGHT OR LEFT HAND END.

Drum Sander Unit:—Drum 6″ diameter by 9″ long. Rubber expanding sleeve type. Table 12″x12″. Adjustable for cut. Two abrasive sleeves furnished. THIS UNIT FOR RIGHT OR LEFT HAND END.

Grinder Unit:—Wheel (not included) 10″ diameter, up to 1¼″ face. Wheel guard has hinged cover. Angle tool rest furnished. Safety eye shield. THIS UNIT MADE FOR RIGHT OR LEFT HAND END.

Type J-45
Oscillating Spindle Sander

Sanders are a necessity in the modern school. They are not usually expensive and bring satisfaction in work well done.

The two Yates-American sanders shown here will cover the required range of work in the school shop. The type J-45 Oscillating Spindle Sander shown at right has been designed for pattern and school shops where sanding is required on internal and irregular work. It is ruggedly built for continuous service with the oscillating mechanism totally enclosed within the base. The vertical adjustment of the table allows full use of the entire length of the abrasive roll.

The circular table not only has vertical adjustment but may be tilted 15° to the right and 45° to the left, the angle being indicated on a graduated scale.

The ball bearing motor is enclosed in the base in a dust proof compartment and is coupled directly to the spindle by means of a splined connection.

The oscillation mechanism is in a separate compartment in the base, protected from dirt and from accidental contact with the operator.

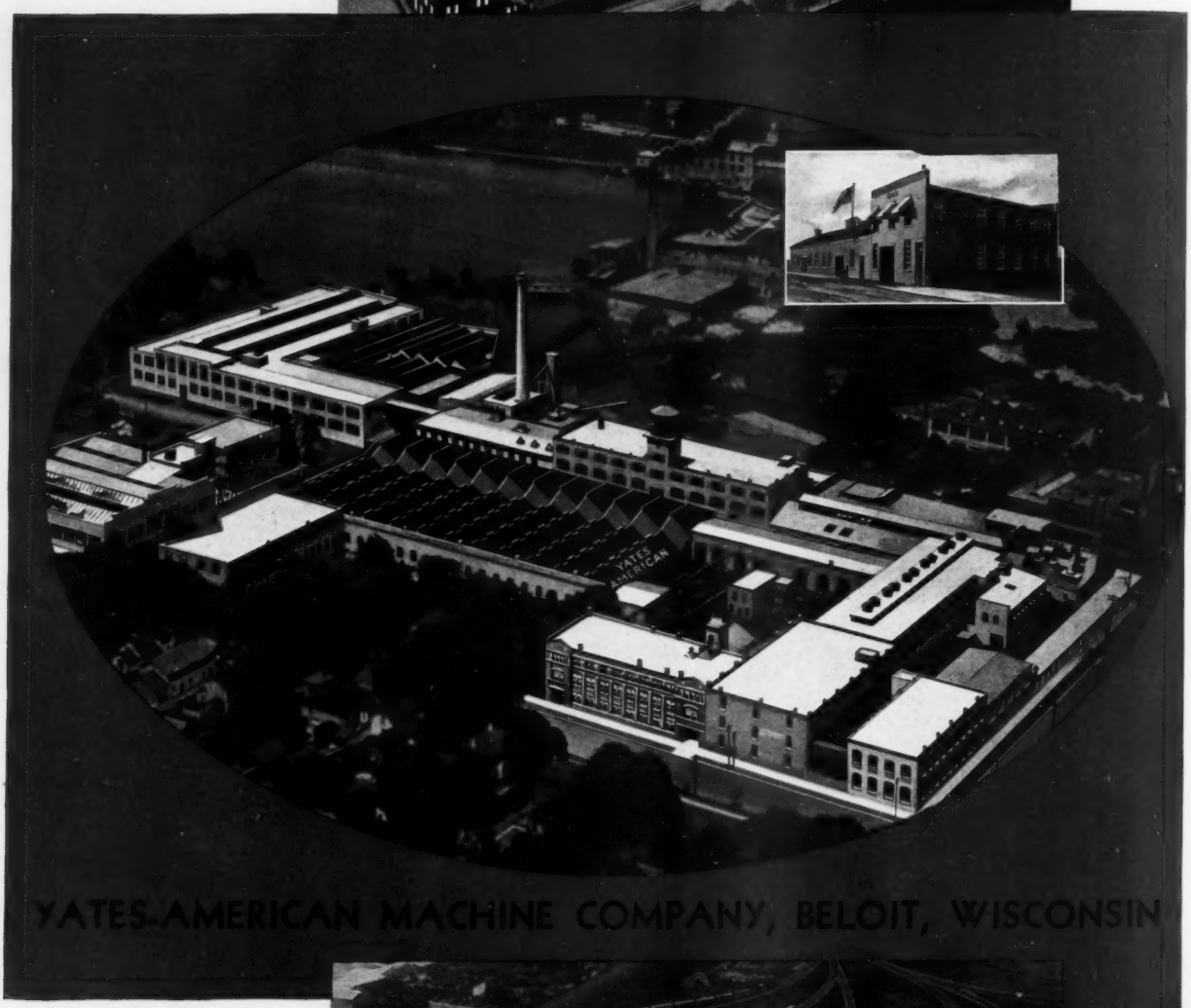
Most school shops will find ample use for a J-45 Sander.

SPECIFICATIONS

Circular table—diameter	20″
Vertical adjustment of table	3½″
Table tilts	to right 15°, to left 45°
Height of table	maximum 38¼″, minimum 35″
Oscillation—strokes per minute	90
Length of stroke	½″
Rubber expanding rolls	1″ to 3″ x 6″
Motor—1800 R.P.M.	½ H.P.

At right:—A J-45 Oscillating Spindle Sander is a busy machine at the Canandaigua Academy, Canandaigua, N. Y.

The plant group on this page shows better than words can describe, the fine factories where Yates-American products are manufactured. These factories are equipped with the most modern tools to permit specialized manufacture of woodworking machines and head and knife equipment. A corps of highly trained engineers is in constant touch with woodworkers throughout the world to translate into practical applications their needs for fast producing, cost saving machinery.



YATES-AMERICAN MACHINE COMPANY, BELOIT, WISCONSIN

In the oval, in the center, is shown the main plant and executive offices at Beloit, Wisconsin. In the insert, within this oval, is the original plant at Berlin, Wisconsin, as it was in 1883. The upper view is the plant at Rochester, New York, the old home of the American Woodworking Machinery Company. The lower view is the Canadian plant of the P. B. Yates Machine Company, Ltd., at Hamilton, Ontario, Canada.

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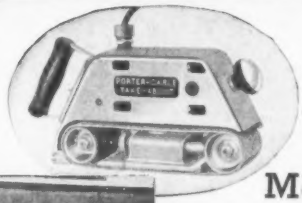

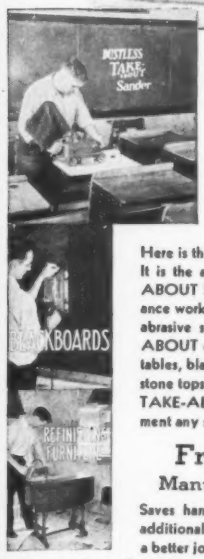

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